WORLD PETROLEUM

APRIL, 1961

one dollar per copy | ten dollars per year | table of contents page 3

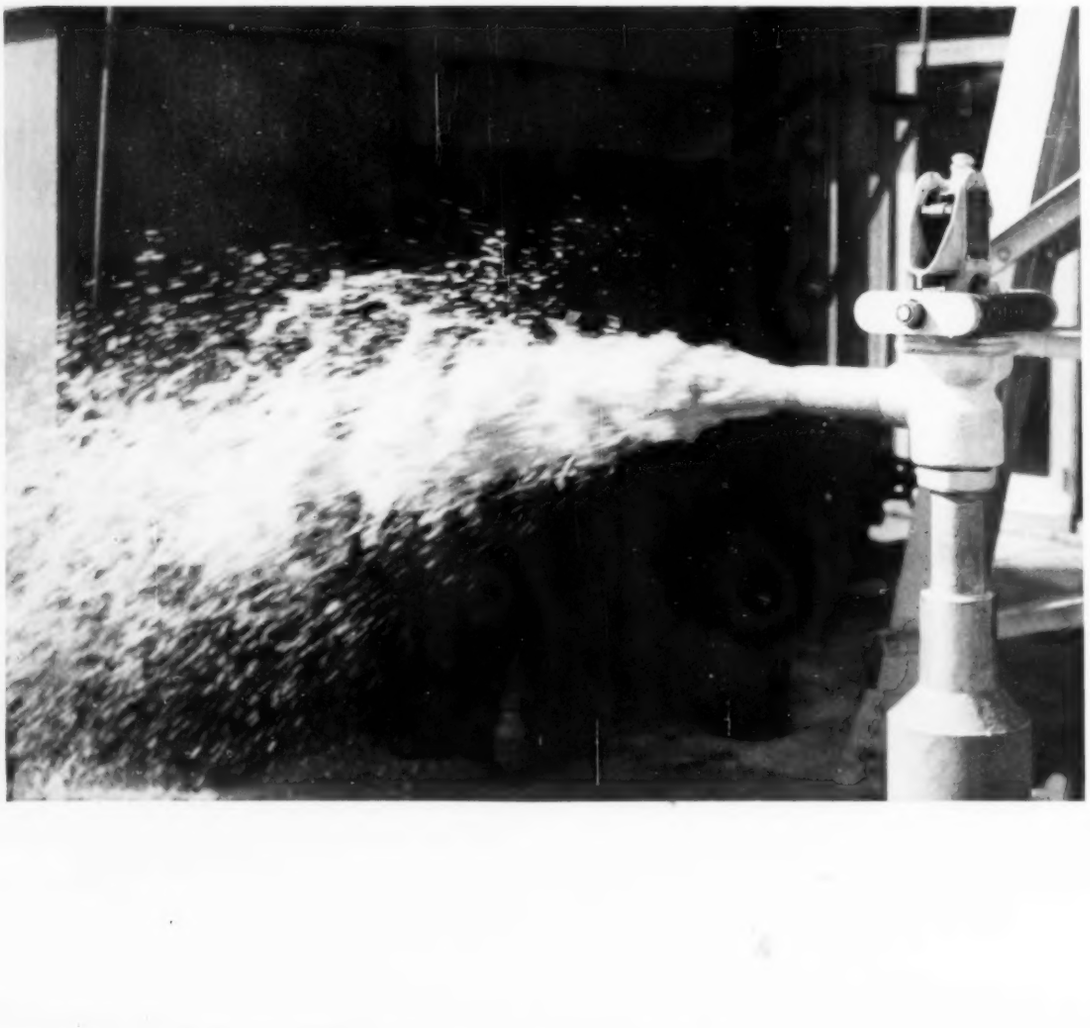
The Cameron Type "A" Reset Relief Valve is a brand new idea — an entirely new type of pressure relief valve. This valve, instantly adjustable in service to the desired relief pressure clearly shown on a calibrated scale, *opens fully* when the pressure exceeds that point and remains fully open until it is manually reset. Abrasive fluids and slurries are no problem because there is no throttling, no leakage, no wire drawing, no cutting — the valve is either fully closed or, instantly, fully open. No special tools and little effort is required for resetting. Operating of the reset lever merely returns the linkage to the set position and does not have to overcome compression of springs.

The Cameron Type "A" Reset Relief Valve assures unequaled safety, performance and economy through these advantages: **1.** Continuously adjustable to relieve at any pressure within range — 1500 to 5000 psi or 750 to 2500 psi. **2.** Opens full — no throttling effect or wire drawing. Piston moves clear and stays clear until valve is manually reset. **3.** Single setting nut easily adjusts to exact relief point, clearly shown by a pointer and a calibrated scale — even with pressure in the valve. **4.** Surging pressure, vibration or extended operation does not affect accuracy of setting. **5.** Moving a single lever resets the valve, no shear pins or special tools are required. **6.** Complete safety in operation — no unguarded moving parts — no flying pieces of shear pins. **7.** A release button provides quick, easy discharge at any time, regardless of line pressure. A light tap with hammer will discharge it at maximum pressure.

Cameron

CAMERON IRON WORKS, INC.
P. O. BOX 1212 HOUSTON, TEXAS

POSITIVE PRESSURE PROTECTION



Growing By Serving

ETHYL'S EXPANDING LINE OF CHEMICALS SERVES MANY INDUSTRIES

For over 37 years, Ethyl has helped refiners produce better, more efficient petroleum products at less cost.

Today, we are expanding our line to serve many other industries as well. Among them are rubber and plastics . . . perfumes, dyes, food processing, pharmaceuticals . . . metal working, metal plating, rockets and guided missiles.

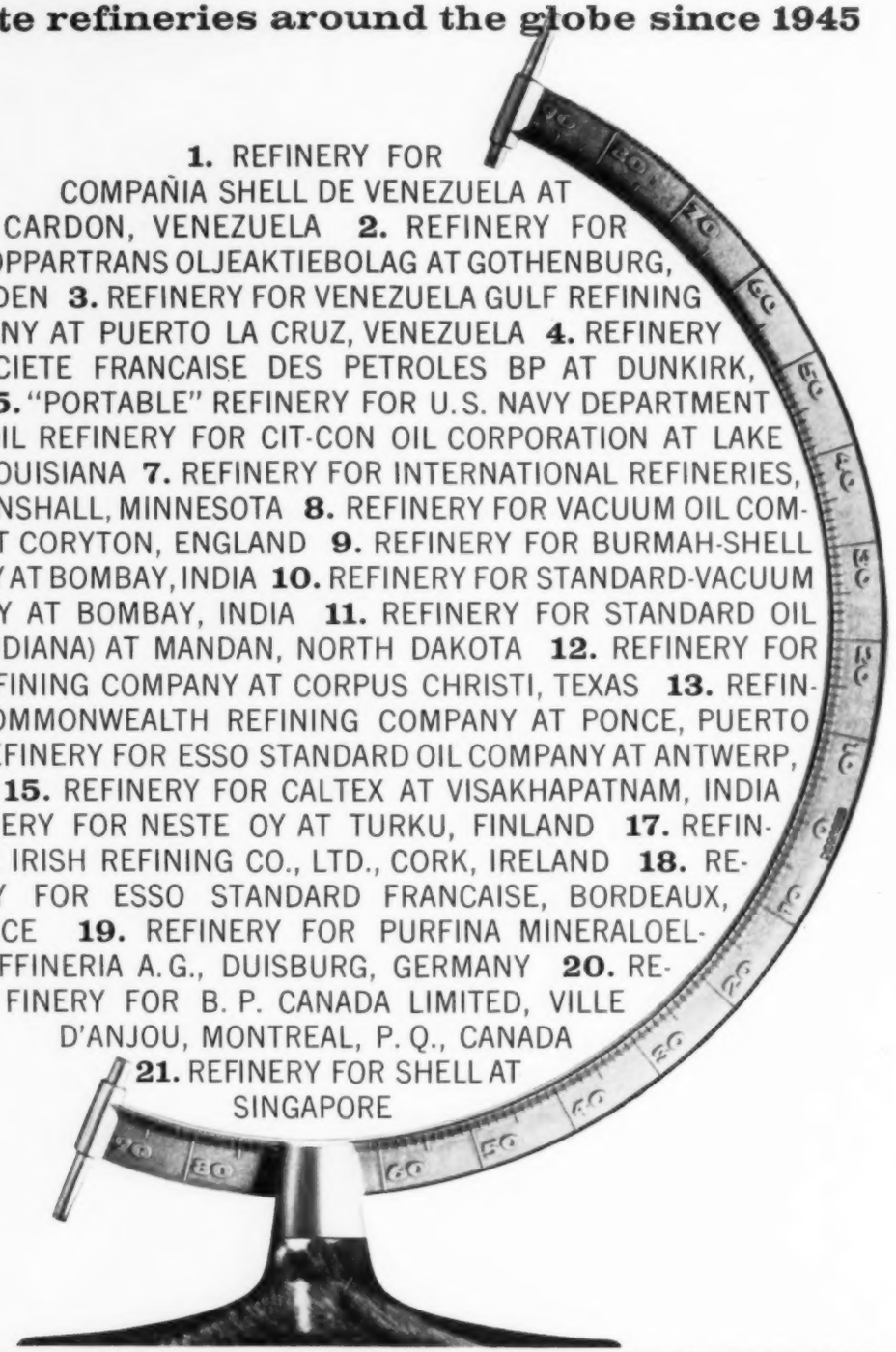
Some of Ethyl's present fields of interest are shown above. As industry continues to expand . . . as chemical processes become more complex, Ethyl will continue to direct its research toward producing chemicals that will meet these new needs.

One or more of those chemicals may improve the quality, lower the cost or speed the processing of your products. In your use of chemicals in petroleum refining or in other manufacturing, it will pay you to think of Ethyl as your supplier. Contact address below.

ETHYL U.S.A.

ETHYL CORPORATION, 100 PARK AVE., NEW YORK 17, N. Y., U. S. A.

21 complete refineries around the globe since 1945



1. REFINERY FOR COMPAÑIA SHELL DE VENEZUELA AT CARDON, VENEZUELA **2.** REFINERY FOR KOPPARTRANS OLJEAKTIEBOLAG AT GOTHENBURG, SWEDEN **3.** REFINERY FOR VENEZUELA GULF REFINING COMPANY AT PUERTO LA CRUZ, VENEZUELA **4.** REFINERY FOR SOCIETE FRANCAISE DES PETROLES BP AT DUNKIRK, FRANCE **5.** "PORTABLE" REFINERY FOR U.S. NAVY DEPARTMENT **6.** LUBE OIL REFINERY FOR CIT-CON OIL CORPORATION AT LAKE CHARLES, LOUISIANA **7.** REFINERY FOR INTERNATIONAL REFINERIES, INC. AT WRENSHALL, MINNESOTA **8.** REFINERY FOR VACUUM OIL COMPANY LTD. AT CORYTON, ENGLAND **9.** REFINERY FOR BURMAH-SHELL OIL COMPANY AT BOMBAY, INDIA **10.** REFINERY FOR STANDARD-VACUUM OIL COMPANY AT BOMBAY, INDIA **11.** REFINERY FOR STANDARD OIL COMPANY (INDIANA) AT MANDAN, NORTH DAKOTA **12.** REFINERY FOR SUNTIDE REFINING COMPANY AT CORPUS CHRISTI, TEXAS **13.** REFINERY FOR COMMONWEALTH REFINING COMPANY AT PONCE, PUERTO RICO **14.** REFINERY FOR ESSO STANDARD OIL COMPANY AT ANTWERP, BELGIUM **15.** REFINERY FOR CALTEX AT VISAKHAPATNAM, INDIA **16.** REFINERY FOR NESTE OY AT TURKU, FINLAND **17.** REFINERY FOR IRISH REFINING CO., LTD., CORK, IRELAND **18.** REFINERY FOR ESSO STANDARD FRANCAISE, BORDEAUX, FRANCE **19.** REFINERY FOR PURFINA MINERALOELRAFFINERIA A.G., DUISBURG, GERMANY **20.** REFINERY FOR B. P. CANADA LIMITED, VILLE D'ANJOU, MONTREAL, P. Q., CANADA **21.** REFINERY FOR SHELL AT SINGAPORE

WHEN YOU PLAN A NEW FACILITY — OIL REFINERY, CHEMICAL OR PETROCHEMICAL PLANT—LUMMUS CAN PUT 50 YEARS OF EXPERIENCE ON MORE THAN 850 PROCESS-INDUSTRY PLANTS THROUGHOUT THE WORLD AT YOUR DISPOSAL.

LUMMUS

THE LUMMUS COMPANY, 385 MADISON AVENUE, NEW YORK 17, N.Y.

NEWARK, N.J. • WASHINGTON, D.C. • HOUSTON • MONTREAL • PARIS • THE HAGUE • LONDON • MADRID

WORLD PETROLEUM FOR APRIL, 1961. Vol. 32, No. 4. April, 1961. WORLD PETROLEUM is published monthly by Mona Palmer, Trustee under the will of Russell Palmer, 109 Market Pl., Baltimore, Md. Editorial and executive offices, 25 West 45th St., New York 36, N. Y. Accepted as a controlled circulation publication at Baltimore, Md. Subscription rate: $10.00 per year. Single copies $1.00.

FOUNDED BY RUSSELL PALMER

Publisher MONA PALMER
Managing Director J. C. CHATFIELD
Editor G. H. BARROWS
Processing Editor WILLIAM C. UHL
European Editor CECIL W. WOOD
Production Manager DORIS H. O'HARA
Art Director CHARLOTTE BLASS

Member of National Business Publications, Inc., and Business Publications Audit of Circulation, Inc.

SUBSCRIPTIONS

1 year, $10.00 2 years, $18.00
3 years, $25.00 Single copies $1.00

GENERAL OFFICES

25 West 45th St., New York 36
(Tel. JUdson 6-4820)

BRANCH OFFICES

EUROPEAN OFFICE LONDON, ENGLAND

G. L. Fetherstonhaugh, St. Paul's Corner, Ludgate Hill, London, E.C.4.
(Tel. CITY 5318)

TORONTO 1, ONT., CANADA

Allin Associates Suite 1019, 2 Carlton St.
(Tel. EMpire 4-2269)

MONTREAL P.Q., CANADA

Allin Associates 2055 Mountain St.
(Tel. Victor 5-6898)

WASHINGTON, D. C.

J. B. Huttlinger National Press Building
14th and F Streets (Tel. EX. 3-3733)

LOS ANGELES 14

T. T. Drake 412 West Sixth St.
(Tel. MAdison 8-1391)

NEW YORK 36

Sales Manager
William Russell Palmer
25 West 45th St. (Tel. JUdson 6-4820)

TULSA 3

O. F. Cozier and Jack F. Cozier
605 Mayo Bldg. (Tel. LUther 3-1335)

CLEVELAND 7

Richard E. Cleary, 15515 Detroit Ave.
(Tel. LAkewood 1-7125)

World Petroleum is published by
Mona Palmer, Trustee
under the will of Russell Palmer
© Mona Palmer, Trustee, 1961

VOL. 32, NO. 4, APRIL, 1961

World Petroleum

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

CONTENTS

4 Washington Pipeline, *by Joseph B. Huttlinger*

10 London Letter, *by Cecil W. Wood*

16 Canadian Notes

32 Processing Review, *by William C. Uhl*

37 Editorial—Oil is International

38 The Future of Suez, *by Mahmoud Younes*

40 A Blueprint for the Middle East, *by Emile Bustani*

42 Rebels and Oil in Algeria

44 Problems in Libya

47 Weight Dropping in North Africa, *by Alan D. Waldie*

48 Stop Disaster!—Major Goal of Newest API Committee, *by J. C. Ducommun*

50 Injectivity Increases Result from Flood Water Carbonation

55 Oil India Pipeline Starts

56 Recent Trends in Aromatic Chemicals from Petroleum, *by Dr. Ralph Landau*

66 Unique Trainers to Aid Refiners

68 Oil Company Staff Changes

74 International News and Notes

80 World Petroleum Statistics, July 1960

90 Latin American Oil News

98 Advertisers' Index

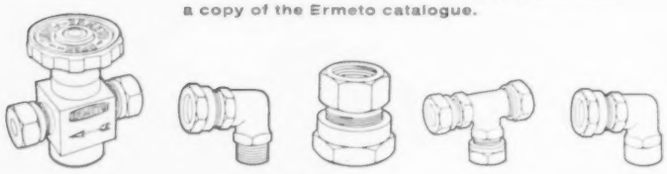
THIS MONTH'S COVER

Huge trucks with flotation-type tires cross the Libyan desert to drilling sites. This photo shows part of a caravan en route to a well by Oasis Oil Co., owned by Continental, Amerada and Ohio Oil companies.

ERMETO

The name that counts in High Pressure

Ermeto high pressure valves are available in many types and sizes for use with a wide variety of liquids and gases. Standard valves incorporate Ermeto end connections, and thus simplify their installation in high pressure circuits. All Ermeto valves are individually tested te one and a half times their working pressure before leaving the works. The valves are manufactured in mild steel, stainless steel and high duty bronze. A large variety of valves with non standard end connections are also produced to suit customers' individual requirements. Our technical staff are always ready to provide further information and will be happy to forward a copy of the Ermeto catalogue.



ERMETO

BRITISH ERMETO CORPORATION LTD

HARGRAVE ROAD · MAIDENHEAD · BERKS · Tel: MAIDENHEAD 5100

A member of the ALENCO Group of Companies

by Joseph B. Huttlinger

Kennedy Hits Prices

President Kennedy spoke out against high prices in general in several of his messages to Congress, but it was a surprise to the industry when he later singled out heating oil for his first specific criticism.

The criticism started with a blast from Secretary of the Interior Stewart L. Udall in opening a hearing into residual fuel oil imports.

"The President is deeply concerned" about heating oil prices, he said. "The President and this administration are not going to stand by and see excessive and inflationary things of this nature in regard to something as basic as fuel that people use to heat their homes. . . .

"The President has directed me to go into this thoroughly to solicit assistance from other departments of the government. . . . I am to report to the President directly on it."

Before the day was over, Morgan J. Davis, president of Humble Oil and Refining Co. of Houston, Texas, told the Secretary that heating oil prices move up and down with the weather. He did not think them excessive, and added that "a little warm weather would bring a dramatic change in the price."

A day or two later, oil industry spokesmen put out the facts about home heating oil prices. True, they went up 12.75% in New York, N. Y., or 1.8¢/gal the past winter, and this put them at 15.9¢/gal, a penny higher than a year earlier, about the same as the 15.6¢ in 1959, ahead of the 15.1¢ in 1958 but below the 16¢ of 1957.

This seemed like a good answer, but it did not suit President Kennedy. At a press conference a week later, he went out of his way to say the increase "has seemed excessive." He said he is "concerned" about "this sharp increase."

Historically, when high officials criticize oil prices, it is a tipoff that an antitrust crackdown is in the making. This could be the case now, but there is much doubt about it. While Department of Justice and the Federal Trade Commission have been asked about oil price changes, there is nothing to indicate they plan antitrust action.

Best sign of what's ahead seemed to lie in Udall's remark that "it certainly would take the heat off if the trend that was so alarming were reversed." And, warm weather was doing just that.

Helium Projects Proposed

Bureau of Mines officials are negotiating with officials of 14 natural gas pipe line companies which have submitted proposals to extract helium from natural gas and sell it to the government.

The 14 proposals suggest building 22 plants.

US officials will choose the most favorable proposals. The amount of choice is indicated by the original plans which called for only 12 plants.

Henry Wheeler, assistant director of the bureau for helium, explains that industry will invest up to $200 million in the plants.

The government will make contracts for up to 25 years to buy the helium, and this would pay back the private companies.

The government has been silent as to the price it will pay for the helium, and this is a matter for negotiation. Plans are for a separate price at each plant. The government then will store the helium against the day it sells it to other government agencies or private industry. The bureau officials have in mind prices of $40 to $44 per mcf of helium on sale to other users.

Present government operated extraction plants have been operated on the basis of $8 to $9 per mcf, but the big new program cannot come close too this, it is stated. One reason is that the private plants need enough to cover taxes, insurance and a profit.

The government would be buying more than it sells in the first few years and so would operate in the red for six or eight years. In fact, the government may be $255 million in the red at the peak.

Later, the government will sell the helium for more than it paid, and the plans are for the government to pay back the Treasury $500 million to cover the outlays on the program, plus interest.

The helium program became effective March 1 under an act of Congress

Pipeline

last year. The aim is to have some 5.5 billion cubic feet of helium which now is burned with the gas and wasted.

Bureau of Mines has a negotiating board talking with company officials. Members of the board are: Marlin Ankeny, director of the Bureau of Mines, chairman (his alternate is Wheeler); C. C. Anderson, the bureau's chief petroleum engineer; C. J. Hann, chief of helium property management; P. V. Mullins, general manager of helium operations for the bureau at Amarillo, Texas; and G. B. Shelton, chief of gas field operation of the bureau at Amarillo, Texas.

Kennedy Plans on Resources

Apparently in a change of mind, President Kennedy skipped over oil, gas and coal in his message to Congress on natural resources.

This seems a change, because earlier information was that the message would back up coal's call for a natural fuels study, and make some reference to oil imports and gas price controls. The message, itself, indicated last minute deletions, as large segments of pages were blank.

The President spoke out for more natural resources planning, in general. He plans a presidential advisory committee on natural resources under the Council of Economic Advisers which will represent federal agencies in the field.

He plans to bolster the national needs work of the council and to have a National Academy of Sciences study of the state of research on natural resources.

He proposed "a special unit" of the U. S. Public Health Service on water and air pollution and promised "a national program for oceanography" in the next budget. He said coastal oceans hold 20% of our reserves of crude oil and natural gas, and thus the importance of the oceans.

Gasoline Tax Due for Battle

Once again, the hottest tax battle before the Congress turns on the level of the federal gasoline tax.

At 4¢/gal now, the tax is due under present law to drop back to 3¢ by July 1. This would cost the federal government about $600 million/year in revenue.

The highway trust fund would be this much poorer, but the present law calls for making up the deficit and then some by earmarking part (about $800 million) of the federal excise tax on automobiles and auto parts for the highway trust fund. Now, these revenues go to the general fund.

President Kennedy spoke out sharply against this program. He said President Eisenhower's program for a 4.5¢/gal tax would be "acceptable" to him. But, he said, he'd prefer a different program. He suggests leaving the gasoline tax at 4¢, for years to come, and boosting the tax on trucks to bring in another $300 million a year, the equal of another half cent on gasoline. He opposed shifting the auto excise to the highway trust fund as "merely shifting money from one pocket to another" and deliberately creating a deficit.

The higher truck taxes would come by hiking the tax on diesel fuel from the present 4 to 7¢/gal; the use tax on trucks over 26,000 lbs from $1.50/1000 lbs now to $5; the tax on tires from 8¢/lb now to 10¢; on inner tubes from 9¢/lb now to 10¢; and on tread rubber from 3¢/lb to 10¢.

Kennedy said that "passenger cars are paying more than their fair share now" but that even with the new taxes on trucks, the big highway carriers would be paying less than their fair share.

And, Kennedy asked curbs on billboard advertising, as he called the highway program "a great windfall" to a handful of large advertisers. He wants bigger bonuses to states which pass billboard curb laws, and if this does not work, "more direct methods."

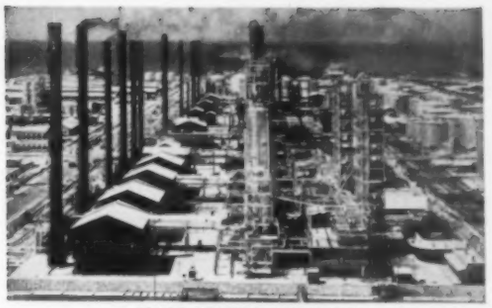
Fuels Study Getting Underway

After a year of birth pangs, a fuels study is about to get under way.

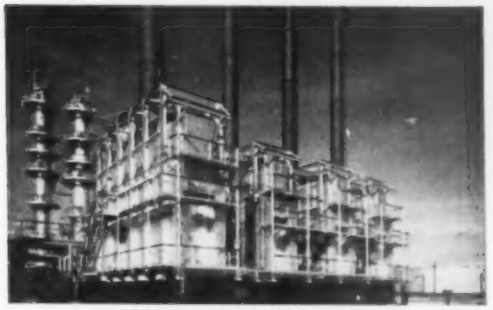
Coal industry leaders, the driving force behind the study, see in it the machinery that could lead to end use controls by curbs on industrial sales of natural gas and on residual oil sales.

First plan, for a House-Senate committee, to make a two-year study to cost $200,000, and report to the Congress January, 1963, has been scrapped. As substitutes, resolutions were put before both the House and the Senate for studies by the one chamber or the other.

(*Continued on page 6*)



CRUDE HEATERS, VENEZUELA



SOVAFORMER HEATERS, U.S.A.

CATALYTIC REFORMER HEATER, FINLAND

Lummus Oil Heaters are sold world-wide

Custom-Designed in New York, Procured Internationally, Payment can be made in Local Currency

Whether for petroleum refineries, chemical or petrochemical plants, Lummus will design, engineer and construct your next heater installation—regardless of size or type—for any major process, around the world.

Lummus heater services are made available on three bases: 1. engineering only; 2. with all material delivered to job site; and 3. completely erected.

Lummus horizontal tube or vertical tube oil heaters, of both special and standard design, range from 100,000 to 300,000,000 Btu per hour. In the last 25 years, the combined capacity of Lummus oil heaters purchased has exceeded that of any other company in the world.

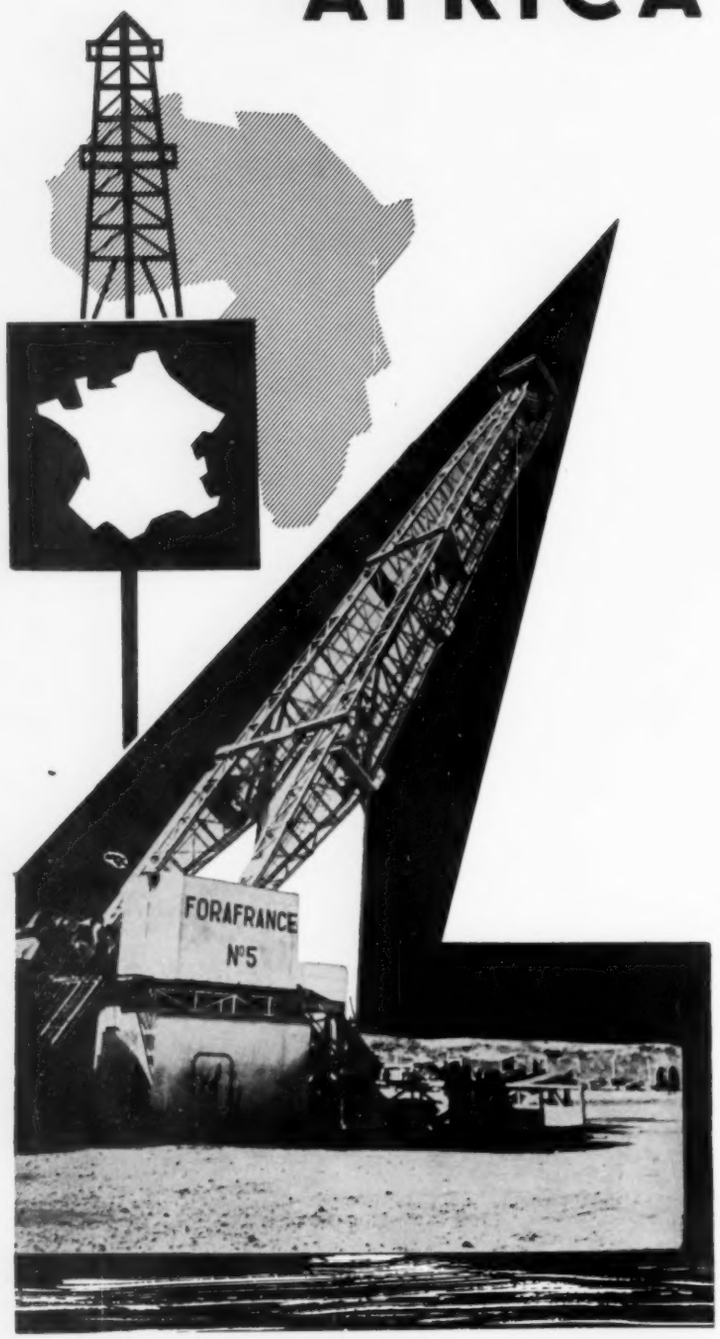
As illustrated above, neither size nor location of the unit presents a problem to Lummus. These units are designed and engineered by the Lummus New York staff, who put the full benefit of their accumulated years of experience into each job. Procurement is made through the nearest of the five Lummus international group of companies and the cost of the job is payable in the currency of the country in which the procurement is handled!

Consult with Lummus on your next oil heater.

LUMMUS

OIL HEATER DIVISION
385 Madison Avenue, New York 17, N. Y.

IN NORTH [redacted]
AFRICA



FORAFRANCE

52, RUE DE LA BIENFAISANCE,
PARIS-8e - EUR. 71-53 et 71-54

At this writing, it is not clear which chamber will make the study, but coal prefers the Senate. Chances are for the Senate to wind up with the job.

Sen. Jennings Randolph, D., W. Va., leader in the Senate drive for the study, tried to appease both oil and gas on the one hand and consumers in New England on the other, in the final and substitute resolution he put before the Senate.

He made changes to recognize that there is a body of law and regulation that is the starting point, at least, of a national fuels policy. This was to please oil and gas, which have fought the study. And he put in that the study shall consider the interests of consumers.

Basic aim of the study is "a full and complete investigation and study . . . of the current and prospective fuel and energy resources of the United States and the present and probable future rates of consumption." The study aims to wind up by providing "an effective national fuels policy."

Randolph, who may wind up as chairman of the committee to make the study, a committee of six Democrats and three Republicans, wants an "impartial" study.

Coal says any "impartial" study will call for curbs on industrial sales of natural gas at "dump" prices and on sales of residual fuel. These are the two main goals of coal forces.

Secretary of the Interior Stewart L. Udall has tapped the ranks of oil and gas for top men to help him. First, he persuaded President Kennedy to name John M. Kelly of Roswell, N. M., an independent oil and gas producer, as Assistant Secretary of Interior for Mineral Resources.

Next, he named J. R. Parten of Houston, Texas, as a consultant, to help get "my thinking straight" on oil and gas matters. Parten is a millionaire oil and gas producer.

Then, he brought in J. Howard Marshall, of Union Texas Natural Gas Co., of Houston, as a consultant on the residual oil import problem.

Finally, he tapped W. W. Keeler of Phillips Petroleum Co., Bartlesville, Okla., to head up a committee to study and recommend a program for U. S. Indians.

Yet to come are appointments to head up the Office of Oil and Gas; and an oil or gas man is likely to be named to this post.

Sees Canadian Imports Acceptable

Lawrence J. O'Connor, Oil Import Administrator, feels that rising imports from Canada to the US will be "acceptable" if they come in gradually "in line with normal growth expansion."

He said that Canada's new petroleum policy foresees an increase in Canadian oil to the US by 125,000 b/d over the next three years. Of this, some 20,000 b/d will go to districts one through four and the rest to the US Pacific Northwest.

This increase "should not alarm our domestic producing industry," he asserted. In Districts I through IV, it would be "a natural increase" and in the West, it would displace other imports.

O'Connor said that increased output of natural gas liquids is a main reason US oil producers are unhappy with the present import program. "Essentially, the control of such liquids lies with the states themselves, and at this juncture, we can only urge that vigorous and forthright action be taken to relate these liquids to overall market demand for unrefined petroleum," he said.

Antitrust Gains Strong Advocate

A man who considers antitrust enforcement second in importance only to survival in the face of nuclear weapons is in line to be the new Assistant Attorney General for Antitrust.

He is Lee Loevinger, age 47, from Minnesota, whom President Kennedy has named.

Loevinger, who gives up a term on the Minnesota Supreme Court for the job, is no stranger to Washington. He worked on newsprint and other problems for the Senate Small Business committee years ago, and he was in the antitrust division of the Department of Justice in New York, N. Y.

Loevinger believes in enforcement by private parties. He feels that even if the antitrust division were multiplied four times, "it would not equal the enforcement effectiveness of private action."

He has advocated fewer settlements of government filings against business firms. He has urged a law to require the government to file a public report in connection with any consent settlement, setting forth its evidence. This could be used by private parties in treble damage actions.

Seek Multiple Use of Public Land

Oil industry officials spoke out against a new measure to bar commercial operations on millions of acres of public lands.

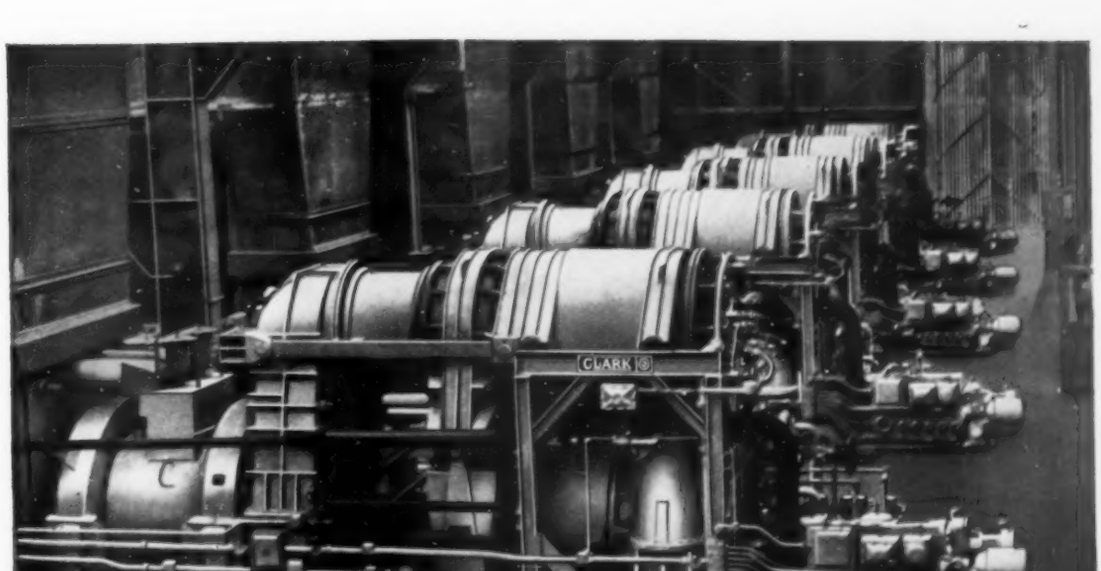
The officials endorsed, instead, a program of multiple use of lands for recreation, oil and gas, timber, sheep and cattle and mining all at the same time.

Robert B. Laughlin of Casper, Wyo., executive vice-president of the Rocky Mountain Oil and Gas Association, complained that at the start about 50 million acres would be "insulated" from commercial activity. He said additions could be made to the area later.

Henry W. Wright, secretary of the Western Oil and Gas Association, asked the Senate Interior committee to hold up action on the measure at least until it receives a final report from the National Outdoor Recreation Resources Review Commission.

Douglas E. Nelson of Colorado, of the Independent Petroleum Association of America, said the "wholesale withdrawal from multiple use" is "inadvisable." He said wildlife refuges and game ranges "should be removed entirely from this bill."

The views were on behalf of S. 174, a measure to set up a national wilderness preservation system. Secretary of the Interior Stewart L. Udall endorsed the aims of the measure as an early witness.



Five Clark Model 305 Gas Turbines drive Clark vertically-split centrifugal compressors operating in series. The station is highly automated with only two operators required per shift.

CLARK Gas Turbines Power Aramco 210,000,000 SCFD Gas Injection Plant

At 'Ain Dar, Saudi Arabia, five Clark Model 305 Gas Turbines are driving Clark Vertically-Split Centrifugal Compressors for the gas injection program of the Arabian American Oil Company. Available fuel for the turbines is sour gas while ambient temperatures soar to unusually high levels.

The 'Ain Dar injection plant draws gas from five gas-oil separator plants at a pressure of 125 psig, compressing it to 2100 psig for injection. Any four of the five series-connected, turbine-driven Clark compressors can provide the necessary pressure ratio for injection. Maximum flexibility is achieved by the use of dual shaft gas turbines. An additional Model 302 turbine drives a 5600 KW generator to power the gas-oil separator plants. Clark Model 305 and 302 Gas Turbines have a standard rating of 8700-9300 bhp.

Proved dependability, minimum maintenance and the low installation costs experienced by other users of Clark gas turbines were important factors in selecting the turbines and centrifugal compressors for the 'Ain Dar plant.

Whether made in Europe, or in the Clark home plant in the U.S.A., all units and components are identical and completely interchangeable. The vast experience of Clark Bros. Co.—in design, manufacture and application—is available to you through the offices listed below.

CLARK BROS. CO. OVERSEAS OPERATIONS DIV.
122 East 42nd Street, New York 17, N. Y.

CLARK BROS. CO. DIVISION, Dresser (Great Britain) Ltd.
197 Knightsbridge, London, S.W. 7, England

CLARK BROS. CO. DIVISION, Dresser (France) S.A.
37, Ave. D'Iena, Paris 16, France

CLARK BROS. CO. DIVISION, Dresser Italy, S.p.A.
Piazza Cavour, 3, Milan, Italy

CLARK DRESSER INDUSTRIES INC.
OIL • GAS • CHEMICAL
ELECTRONIC • INDUSTRIAL

Parking garage in Bristol, England

"The marketing concept—the orientation of business to the customer and his needs—has brought about a revolution in business, but not yet in adequate measure in the oil industry. While demand was strong and steady our task was to find oil and bring it to the customer and we had little incentive to blaze new marketing trails. Now it is high time for us to do so."

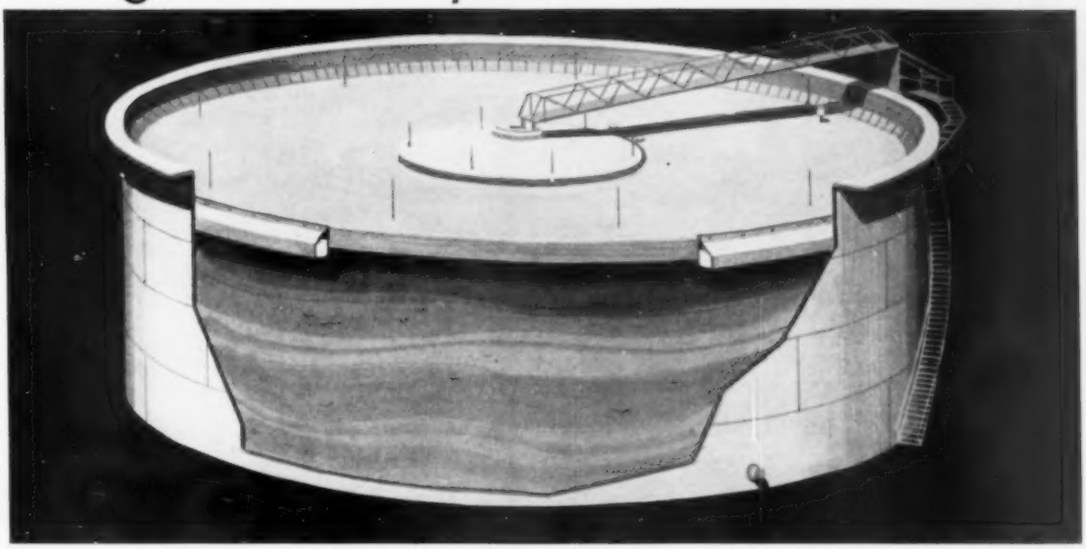
—M. J. Rathbone, President

ESSO

Standard Oil Company (New Jersey)

(WHOSE PRINCIPAL U.S. OPERATING AFFILIATE IS HUMBLE OIL & REFINING COMPANY)

No gas! No liquid! A SOLID seal!



nothing can disable

EverSeal*

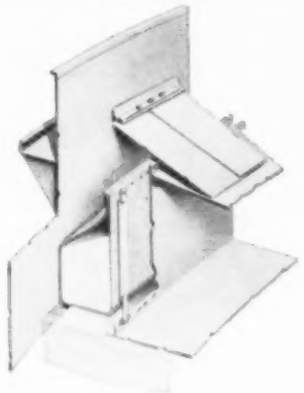
General American's new cushion seal for floating roofs

Tear it! Gouge it! Puncture it! The seal will hold. No matter what the damage, it will not burst or rupture! There's nothing in EverSeal to spill or leak.

Urethane cushions firmly joined and enclosed in a vapor-tight, no-scuff envelope of BUNA "N" and PVC are protected by the General American weather hood.

EverSeal resists the abrasive action of rough tank walls, yet will not scratch or damage tank coatings.

Get the complete details about EverSeal! Write the General American licensee nearest you. For any type of conservation structure, *it pays to plan with General American.*



WHY THE NEW GENERAL AMERICAN EverSeal IS FAR BETTER THAN ANY TUBE TYPE SEAL

1. No liquid or gas to leak
2. Replace entire seal or a section without taking roof out of service
3. EverSeal will accommodate a 10" variation in annular space between roof and shell
4. No moving parts—nothing to corrode
5. Costs less than most other seals
6. Permits full travel of roof, yet rides easily over projections on shell and maintains seal
7. Protected from sun, rain, snow and dirt by the General American weather hood
8. Eliminates buildup of vapors in seal area
9. Will not freeze to sides of tank
10. Provides full protection for oxygen-sensitive stocks

**Patent Rights Reserved*

Overseas Division

GENERAL AMERICAN TRANSPORTATION CORPORATION

380 Madison Avenue • New York 17, New York

For further information communicate with your nearest licensees:

Ashmore, Benson, Pease & Co. Africa (Pty.) Ltd.
P. O. Box 8608
Johannesburg, South Africa

Societa per Azioni Forni ed Impianti Industriali Ingg. de Bartolomeis
Via Settembrini, 7
Milan, Italy

Etablts. Delattre et Frouard Reúnis
Rue de la Bienfaisance, 39
Paris 8, France

A. E. Goodwin Ltd.
315 Parramatta Road, Auburn
Sydney, N. S. W., Australia

Redheugh Iron & Steel Co. Ltd.
Teams, Gateshead,
Durham, England

Sanson Vasconcellos Comercio e Industria de Ferro, S. A.
Avenida Rio Branco 81-13° Andar
Rio de Janeiro, Brazil

Carl Spaeter, G.m.b.H.
Postfach 3928
Saarlandstrasse 2-30
Hamburg 33, West Germany

Taiwan Machinery Manufacturing Corporation
25 Kung Yuen Road II
P. O. Box 30
Kaohsiung, Taiwan (Formosa)

T. I. W. Western Ltd.
97th Street and 126 Avenue
Edmonton, Alberta, Canada

The Toronto Iron Works, Ltd.
629 Eastern Avenue
Toronto, Ontario, Canada

Tsukishima Kikai Co., Ltd.
9, 5-chome, Tsukishima-dori
Chuo-ku, Tokyo, Japan

Vereinigte Osterreichische Eisen- und Stahlwerke A. G.
VOEST
Postfach Nr. 2
Muldenstrasse Nr. 5
Linz-Donau, Austria

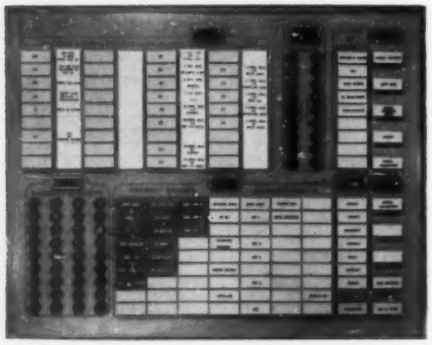
SM and BP 1960 Highlights

Shell-Mex and B.P. Ltd.'s 1960 trading figures showed big increases over the records made in 1959, according to the company's annual review. Working capital at the end of the year totalled £110 million, representing over £11,000 per employee.

By far the largest sales increase was in fuel oils and there was noteworthy advance in the domestic field. Among the major new contracts secured were those for heavy fuel oil for Consett Iron's new £14 million plate mill and for all oil requirements for the atomic power station building at Dungeness, possibly the world's largest.

Particular attention is being paid to developing greater efficiency and economy in distribution. Outstanding in this sphere is the new "guinea-pig" installation at Royston, where experiments were carried out with two innovations.

New Direct-Order-Recording-and-Invoicing System, the DORIS installation at Royston, showing the input console. Only three of the seven panels is shown in this view



Central control and operating panel of the DORIS input console

One concerned the use of equipment for remote control of valve opening and closure and for quantity and temperature recording of tank contents. The main line of research, however, was the pioneering development of DORIS (Direct-Order-Recording-and-Invoicing-System), an electronic system which may revolutionize the company's office work. DORIS has a 30 mph memory, recording and processing customers' orders as they are received, printing a delivery ticket, calculating the price and printing the invoice, and providing a punched paper tape record of the sale for stock control and accounting purposes. The system has been proved to have tremendous advantages in many directions and it may become a vital part of Shell-Mex and B.P.'s entire distribution network.

Flexible Oil Spillage Booms

A second neoprene inflatable oil boom has recently been installed on the Manchester Ship Canal, a unit about 650 ft long for sealing off a temporary cut-out berth at Ellesmere Port. Its feature is that it can be sunk speedily by releasing the air within the boom to allow vessels to enter and leave the berth. These booms have been developed and are made by William Warne & Co., of Barking, Essex, and this is the second to be supplied for Ellesmere Port.

A new unit is nearly ready for delivery to Esso Petroleum at Fawley and one was also recently delivered for use at the company's refinery at Milford Haven. The latter incorporates a new method under trial for attaching the end of the boom to the tanker. The value of this means of containing oil spillage and of preventing the spread of burning oil was proved beyond doubt at Milford Haven last year; some 600 tons of burning crude was contained for over an hour and the boom remained inflated. Another oil company is planning to use a 450-ft Warne boom on a main refinery water pond and separator.

The makers are now developing an 8-in. or portable type, made in 25-ft lengths and readily transportable in a small vehicle for emergency action, say for towing between launches for encircling any oil patch. This type could be speedily inflated by the vehicle exhaust or by air cylinder to the normal 2 psi required. Standard booms are in 50-ft lengths inflatable to a tube diameter of 16 inches—the size considered the minimum that will stand sea buffeting and at the same time support the weighted skirt which hangs below the tube to a depth of 22 inches to prevent oil seeping underneath the tube.

New Shell Laboratory

"Shell" Research Ltd. has opened a new laboratory —the Tunstall Laboratory—near Sittingbourne in Kent, to be devoted to the study of the possible effects on man and other vertebrates of contact with products being developed by Royal Dutch/Shell group companies. This has four divisions—pathology and pharmacology, physiology, chemistry, and biochemistry—and the director is Dr. C. G. Hunter, formerly assistant professor in the Banting and Best Department of Medical Research at the University of Toronto.

Film on High Speed Flight

Such has been the success of the "High Speed Flight" series made by Shell Film Unit between 1956 and 1959—"Approaching the Speed of Sound," "Transonic Flight" and "Beyond the Speed of Sound"—that a simplified version has now been made in a single colored film for those who are not able to see all three on separate occasions or whose interest in the subject is of a less specialized character than that of aeronautics students.

This shortened 21-minute version, made in 35 and 26 mm gauges, presents a difficult subject in a very clever and interesting manner and there is no doubt it will appeal to a wide range of audiences. It is all the more interesting by reason of its simplified explanation of the use of the remarkable Schlieren technique in aircraft speed studies. The film is available on loan, free of charge, from Shell Film Unit, Shell-Mex House, Strand, London, E.C.2.

Opposition to Pipelines' Bill

The London County Council and 14 other interested local authorities have petitioned Parliament to make drastic changes in the bill presented by Trunk Pipelines Ltd. which seeks authority to construct a 70-mile common carrier products line from Canvey Island (Essex) across London to Denham (Buckinghamshire).

LCC objections rest largely on the grounds that the bill does not make adequate provision to enable it, as a fire-fighting authority, to impose specific structural requirements to limit the risk of breakage or to limit the extent of a leakage. The joint objection of the local authorities centers in the main on the nearness of the pipeline to the surface and the relation of this to any road improvement schemes.

In general it is also submitted that it is most undesirable that the bill should become law before the government has completed its inquiries into the general problems arising out of pipeline development on a national scale, or before the various authorities whose statutory functions may be affected have had the opportunity to consider the government's conclusions and express their views upon them.

New SM and BP Departments

T. W. Mathias, Shell-Mex and B.P. general manager-operations since 1951, has relinquished this appointment in order to undertake other special duties on behalf of the company but he remains a general manager.

Following the retirement of H. Cunliffe as general manager—industrial fuels, changes have been made in the allocation of sales duties at the general manager level. A new industrial fuels department has been formed, representing a merger of the fuel oil and liquefied petroleum gas interests. George Richardson, manager of Shell-Mex and B.P. Gases Ltd., has been appointed manager.

The functions of distribution department and of the supplies and transportation department have also been rearranged. The division now is between a supplies and distribution department (manager—D. H. F. Joyce, manager of the former supplies and transportation department), and a ship's management department (manager—J. R. L. Moore, DSC).

In addition the functions of domestic fuels and agricultural departments have been divided. There are now a domestic fuels department (manager—A. V. Driver) and an agricultural department (manager—E. F. Westray).

M. E. Weinstein has been appointed manager of the trade relations department and also retains the position of chief economist which he has held since 1954.

Record Kent Refinery Runs

Almost 18 million tons of oil were handled last year by British Petroleum's Kent refinery, a new high record. Some 2,775 tankers were berthed and another 1,680 ships took on bunkers. Since operations started in 1953, the Kent jetties have handled nearly 83 million tons of oil and over 29,000 berthings.

Is JP-4 Fuel Safe?

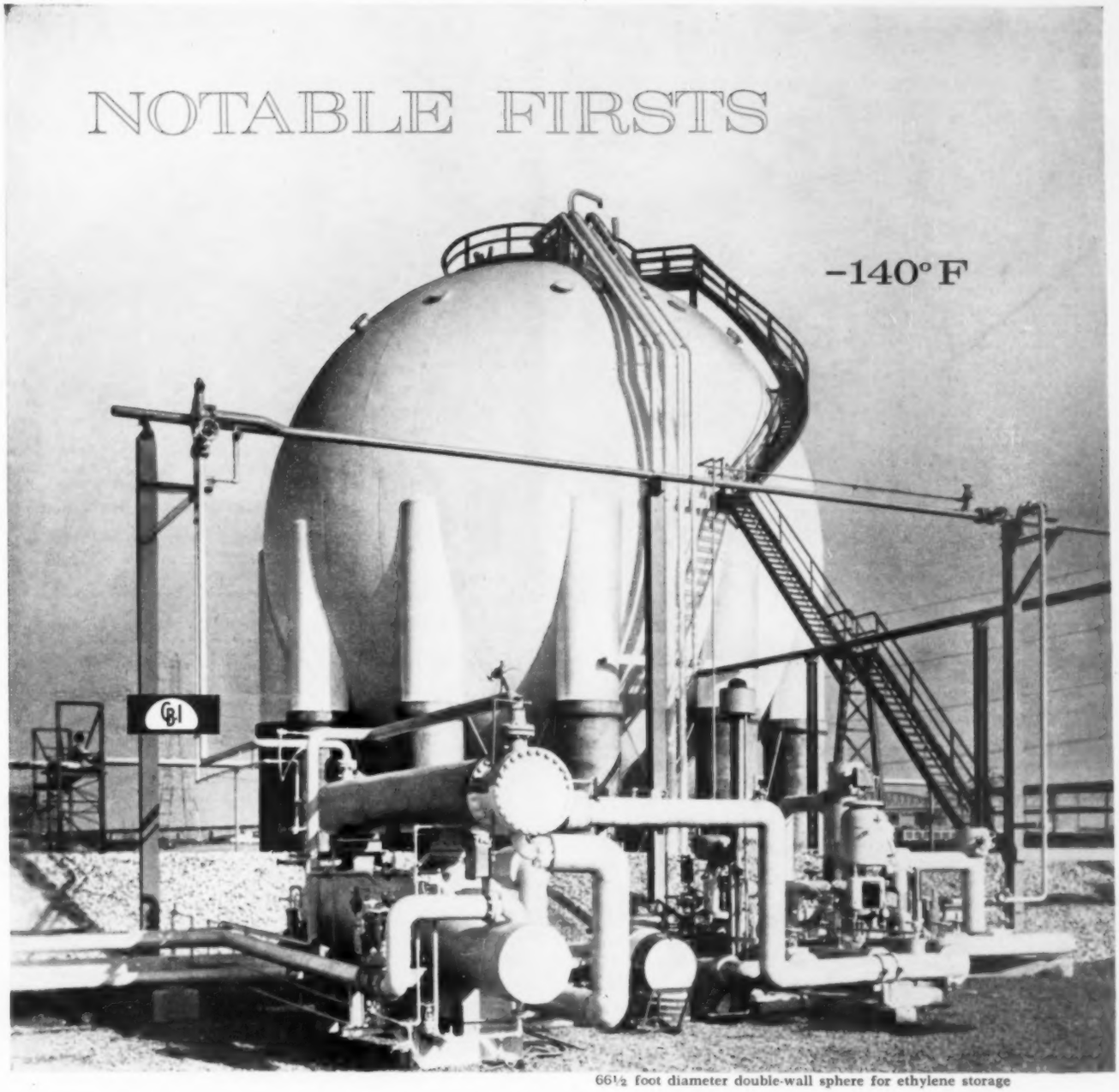
The Minister of Aviation has ordered an investigation by further technical studies into the alleged greater fire risk to turbine aircraft, both jet and turbo-prop, from the use of a fuel more volatile than kerosine, particularly on takeoff and landing.

A strong demand has arisen for this inquiry because of the changeover by a few foreign operators from the use of aviation kerosine (JP-1 or JP-1A) to JP-4 or wide-cut gasoline, a fuel described as somewhere between the lowest grade of gasoline and kerosine.

There are genuine divisions of opinion in the world air transport industry, but in the UK the Air Registration Board has expressed the opinion that in certain circumstances, after a crash has occurred, the use of JP-1 offers passengers better prospects of escape

(*Continued on page* 12)

NOTABLE FIRSTS



66½ foot diameter double-wall sphere for ethylene storage

FOR LIQUID ETHYLENE

The 20,000 bbl. sphere in which liquid ethylene is stored at −140°F at the Bayway Refinery of Esso Standard, Division of Humble Oil & Refining Company, Linden, New Jersey, has the distinction of being the largest double-wall sphere as well as the largest above-ground storage unit for ethylene in the U.S.

CB&I's extensive experience in cryogenic storage was called upon, through Stone & Webster Engineering Corporation, to design, fabricate and erect the sphere. This is another example of how CB&I readily provides the most suitable cryogenic storage unit when new liquid gas storage requirements arise.

CB&I has built more than 75% of all of the field-erected cryogenic storage vessels in the world. May we tell you how this experience can provide the most advantageous liquid gas storage for you?

CB&I

Chicago Bridge & Iron Company
332 South Michigan Ave., Chicago 4, Ill.
Offices and Subsidiaries Throughout the World

CB 649

(*Continued from page 10*)

without harm. Accordingly the government has accepted that a *prima facie* case exists for a review of the matter and a verification of the precise significance or size of the possible safety margin in favor of JP-1.

100,000-Gallon "Dracone"

A 100,000-gallon (350-ton) flexible "Dracone" container, the latest and largest to date, has recently completed trials in the English Channel, carrying a cargo of kerosine, and a sister "ship" is also being made by P. B. Cow & Co Ltd. for Dracone Developments Ltd.

Though 200 ft long and 10 ft in diameter, this container consists of a neoprene- nylon-nitrile complex under a quarter of an inch thick, and Du Pont neoprene synthetic rubber was specified because of its high tensile strength, resistance to abrasion, and other special properties. This rubber is now being made by Du Pont Co. (United Kingdom) Ltd. in a 50 million lb/yr plant in Northern Ireland. So much commercial experience has now been gained with this means of liquid transportation that it is considered that within five years a unit capable of carrying 5,000 tons could be built. Production facilities are already adequate for a 1,000-tonner.

Clark Bros' UK-Built Gas Turbines

The first of four gas turbines built by Hawker Siddeley Brush Turbines Ltd. for Iraq Petroleum Co.'s trans-Syrian pipeline passed its acceptance tests recently. These were built under license from Clark Bros. Co., New York, and the tests included seven hours' continuous load running, four of which corresponded to the maximum site rating of 6,600 bhp.

These turbines, which are available up to 9,300 hp, are the first of this type—the HSBT/Clark gas turbine—to be built in the UK. They have been proved to give high reliability under the arduous conditions of pipeline operation, largely because they operate with a maximum gas temperature which is very moderate by gas turbine standards.

Protecting Transformer Oil

Interesting design features are incorporated in Mobil Oil Co.'s two new 2,500-gallon, semi-trailer, transformer-oil tank trucks to ensure delivery of this delicate product at its highest dielectric strength. These articulated vehicles are coupled to Leyland Super-Comet tractors.

The tanks are stainless steel constructed by Yorkshire Engineering & Welding Co. and incorporated Crane's running gear with air suspension. Each consists of three 500-gal and one 1,000-gal compartment. All these are fitted with silica gel breathing equipment to prevent contamination from moisture in the air, and with 16-gal conservator tanks, housed on top of the trailer, to ensure accurate compartment filling. Bottom loading is employed and the pipe system incorporates Exactor self-sealing couplings. Accuracy of delivery is ensured through a Wayne flowmeter.

65,500-Tonner for Shell Tankers

A 65,500-dwt, 16½-knot tanker, the SS "Sepia," has been launched at Birkenhead by Cammel Laird & Co. (Shipbuilders and Engineers) Ltd. for Shell Tankers NV. Main dimensions are: length overall, 817 ft 9 in.; breadth moulded, 112 ft 6 in.; depth moulded to upper deck, 57 ft 9 in.; and summer draft, about 42 ft 6 in.

Propelling machinery consists of one HP and one LP ahead turbine, also one HP and one LP astern turbine. The HP astern turbine is overhung from the HP ahead and the LP astern is incorporated in the LP casing. Power is transmitted through double reduction articulated gearing to a single screw propeller and the turbines are capable of developing a maximum power of 22,000 shp.

BP Purchases in 1960

BP Trading Ltd. placed orders during 1960 to the value of £17.4 million for materials, equipment and services, an increase of £5 million over 1959. Of this total, over £14.3 million was placed in the UK. In addition, refineries and other main subsidiaries of British Petroleum placed orders in the UK valued at £4.6 million.

Appointments

CHARLES HULL has been appointed general manager of the Shell refinery at Stanlow, succeeding **C. R. MIDDLETON**, who has retired after holding this position since 1950. Mr. Hull has been manager of the oil products development department since 1956 and since joining the group in 1937 has held refinery positions in the UK and several countries abroad, including a period as manager of the Suez refinery.

C. Hull

A. Threlfall

ALAN THRELFALL has been appointed sales manager of Perkins Gas Turbines Ltd. and is responsible for coordinating the company's sales throughout the world. Before joining Perkins he had considerable experience in gas turbine development with Lucas Industrial Equipment Ltd. and Dowty Fuel Systems Ltd.

C. J. J. CLAY has been appointed a director of London and Thames Haven Oil Wharves Ltd. Mr. Clay is on the board of Antony Gibbs & Son Ltd., merchants and bankers.

DR. W. B. PEUTHERER, general manager of British Petroleum's Grangemouth refinery, has been appointed general manager of Scottish Oils Ltd., succeeding **DR. G. H. SMITH**, who has retired.

R. SARGEANT has been appointed managing director of Woodfield Rochester Ltd.

G. B. HUISKAMP, Royal Dutch/Shell group finance coordinator, has been made a director or Shell International Petroleum Co.

J. W. SMITH has been appointed director of contract operations for Kellogg International, London. He assumes the duties of **B. W. JESSER**, who has become assistant vice president and director of engineering for M. W. Kellogg in New York.

US Equipment Links

W. H. Dorman & Co. Ltd., engine manufacturers of Sheffield, announced a "multi-million dollar contract" to supply Fairbanks-Morse & Co., of Chicago, and a subsidiary of Fairbanks-Whitney Corp., New York, with its "basic" diesel engines in the 40 hp to 700 hp range for marketing throughout America. This 20-year agreement is expected to be worth $5 million a year to Dormans within the next three years and the 1961 total will top the $1 million mark. Later it is possible that Dormans will manufacture certain Fairbanks-Morse engines in the UK for the European market and, conversely, Dorman engines may be made in the US by Fairbanks-Morse under license.

Rotron Controls Ltd. has been formed as a new subsidiary of the Elliott Automation group, two-thirds owned by Elliott Brothers (London) Ltd. and one-third by The Rotron Controls Corp., of Woodstock, New York. The company, whose headquarters are at Elliott's Airport Works, Rochester, Kent, will make the Rotron range of flowmeters and associated equipment and market them throughout Europe, the Middle East and the Commonwealth (except Canada).

The Rotron flowmeter measures the rotational speed of a vortex created outside the main stream, which is directly proportional to the fluid flow rate in the pipeline, and it is claimed to provide a substantially more accurate measurement than meteres normally used. A magnetic coupling enables rotor revolutions to be transmitted to read-out devices or to date-processing systems. An internal by-pass arrangement gives adjustment over a wide flow range while in operation.

For the first time prospective owners of the famous 4-wheel drive "Jeep" produced by Willys Motors, of Toledo, Ohio, have the option of a Willys "Hurricane" gasoline engine or a versatile and flexible new 4-cylinder diesel engine made in England by the Perkins group.

This is one result of the sales agreement reached between these two internationally-famous automotive firms.

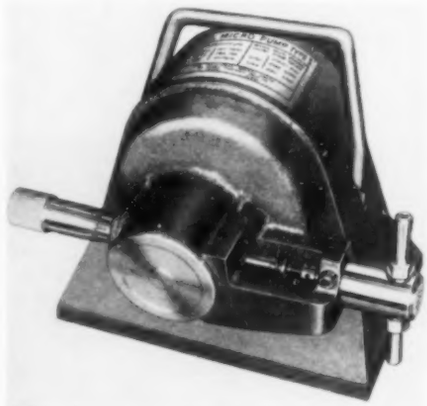
The Perkins Four 192 engine, which develops 62 hp at 3,000 rpm, is available in the CJ-5 and CJ-6 export models of the "Jeep" Universal and the one-ton "Jeep" pick-up truck. It employs the Perkins combustion system with twin-hole injectors and is fitted with a compact distributor-type fuel pump incorporating an hydraulic governor.

British Equipment News

The first British gas turbine generator set in Canada, made by *The English Electric Co. Ltd.* and installed some six months ago by the government of Alberta in the new extension to Alberta University's power plant, is reported to be proving very satisfactory.

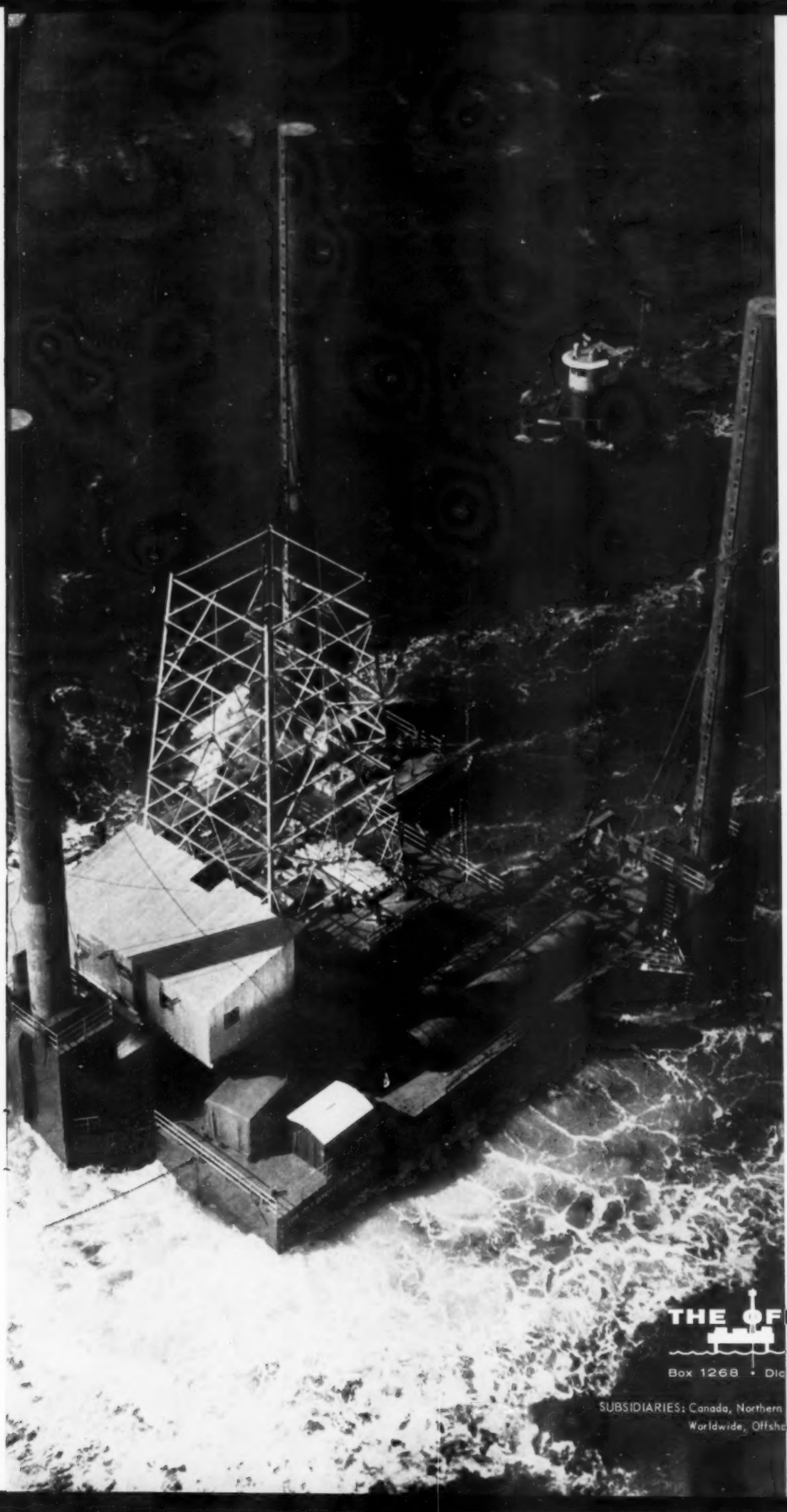
The EM 27 turbo-alternator set works on natural gas and is equipped with an English Electric standard plate type regenerator with a thermal effectiveness of about 60%. The set has a power output of 1,850 kw at 59° F and 14.7 psia. A "Spanner" waste heat boiler in the turbine exhaust generator 10,000 lb/hr of dry saturated steam at 10 psig when the turbine is operating at normal rated load.

Elliott-Automation Ltd. has made joint marketing arrangements for certain applications between The Rheostatic Co. Ltd. and Black Automatic Controls Ltd., both member companies of the group. Rheostatic is now selling the wide range of Black solenoid-operated valves and pressure and flow switches under the name "Black-Satchwell" alongside its own range of Satchwell controls, and will also include the former when offering comprehensive control schemes.



The Distillers Co. Ltd. announces that its range of DCL metering pumps is being further extended by the addition of the type "S" Micro Pump in a wide range of capacities—from zero to 100 cc/hr up to zero to 1,500 cc/hr. All are controlled by micrometer adjustment and have gearless Nelson hetrapolar motors.

The Cape Asbestos Co. Ltd. has acquired a financial interest in Aislantes Industriales, of Mexico City, manufacturers of insulation products, and the Mexican company will within a few months begin making "Caposite" amosite pipe sections for high temperature insulation in a new factory now under construction. Mexico will thus become the twelfth country in which Cape Asbestos products are made locally.



FOR THE BEST IN OFFSHORE DRILLING CONTRACT SERVICE

Owners and operators of the largest fleet of deepwater mobile drilling units in the world, *The Offshore Company* pioneered in developing the Self-Elevating Mobile Platform. Rig 58, shown here en route to a drilling location in the Caribbean, is a platform of this type. It is the Company's first Self-Elevating Mobile Platform designed for use with a tender vessel, and was placed in service in February, 1961. Look to *The Offshore Company* for efficiency and dependable economy in any drilling situation—deepwater locations, shallow waters, and land operations—through more than 25 years of experience and *selection of the correct type of drilling unit for the job.*

THE OFFSHORE COMPANY

BATON ROUGE, LOUISIANA

Box 1268 • Dickens 4-6703 • Cable Address: OFFSHORE

SUBSIDIARIES: Canada, Northern Offshore, Ltd.; Venezuela, Offshore Venezuela, C. A.; Worldwide, Offshore International, S. A.

Cementing. We have been in the business of oil well cementing for more than three decades. From surface string to squeeze cementing, you can depend on BJ Service to deliver on the tough jobs as well as the routine runs.

Fracturing. BJ Service has developed many new hydraulic fracturing techniques and high-pressure pumping units. Our advanced methods, materials and equipment pay off for you where it counts—at the wellhead.

Acidizing. Since the beginnings of well acidizing in 1932, we have initiated or played a substantial role in the development of every treating fluid and technique in current use. Twenty-eight years of results speak for themselves!

Wire Line. In 1947, BJ Service performed the *first* successful commercial oil well jet perforating job. In jet and bullet perforating and in other wire-line services, BJ Service continues to be a leader!

BJ SERVICE, INC.

A BORG-WARNER SUBSIDIARY

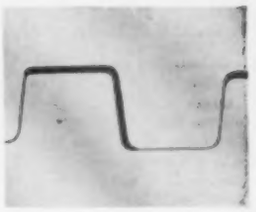
Long Beach, California • Arlington, Texas • Stations in all major oil fields

B-W

The type of pipe joint is of decisive importance to rapid, smooth drilling operations. The absence of pipe sockets, which is a characteristic feature of Extreme Line Casing*, incorporates various substantial advantages:
The negligible diameter increase in the joints enables easy running and materially helps to step up drilling speeds and to attain greater drilling depths.
Reduction of threaded joints by one half the number required in conventional types of casing simplifies assembly work with resultant time and manpower economy.
Extreme Line Casing also offers a variety of additional advantages: positive sealing of joints, high resistance to stripping and insensitivity of thread to damages.
Available in the following API grades J 55, N 80, P 110. Dimensions 5", 5 1/2", 6", 6 5/8", 7", 7 5/8", 8 5/8", 9 5/8" and 10 3/4".

* Manufactured under license by The National Supply Company, Pittsburgh, USA

Fit of seal



Engagement of thread

MANNESMANN-EXPORT

Düsseldorf · Germany

Branch Offices and Representatives
all over the world. In Great Britain:
Mannex (London) Ltd. Universal House,
60, Buckingham Palace Road, London S.W.1

Better means for faster drilling

CANADIAN NOTES

National Oil Policy Announced

The oil industry was told it has three years to increase Canadian oil production to 800,000 b/d—or else. The target is to be reached gradually—starting immediately.

In a statement on a long-awaited National Oil Policy, Federal Government's Trade and Commerce Minister George Hees announced in Ottawa February 1st that:

"These targets are to be reached by increased use of Canadian oil in domestic markets, west of the Ottawa Valley, and by some expansion of export sales, largely in existing markets which can be reached through established pipelines."

Mr. Hees stated that for a start the production level for this year should average 640,000 b/d, with not less than 625,000 b/d to be met by June of 1961.

The government indicated the target should be reached on a voluntary basis and it will be up to the oil firms themselves. If the industry fails to meet this target, the Energy Board will be granted power to impose import and export quotas.

In the meantime, importers of crude and petroleum products are required to make monthly reports on their imports to Ottawa.

Canada's oil production during 1960 averaged between 525,000 b/d and 550,000 b/d compared to her potential production of one million b/d.

The announcement of a National Oil Policy means that oil producers will emphasize oil marketing expansion in Ontario as well as increased exports to the U.S. midwest and the Puget Sound areas. One immediate source of increased market is expected to be in Ontario which gets more than 50,000 b/d of petroleum products from the Montreal refinery area, the main importer of foreign crude.

The Canadian Petroleum Association stated the policy will have a beneficial effect on the industry. The Independent Petroleum Association of Canada stated the policy is a major step to make Canada self sufficient in the balance of petroleum.

The Canadian government's ultimatum has drawn mixed reactions from oil-company officials. Firms generally agree that a gain is desirable, but some doubt that the stated goal can be hit by 1963. BP Canada Ltd. called the government's policy "reasonable," but had some reservations about reaching 800,000 b/d goal by 1963. Texaco Canada Ltd. was concerned about suggested level of future output, which it felt is "ambitious." Imperial Oil Ltd. said it would "extend the fullest cooperation," and Shell Canada Ltd. said target is formidable and will take considerable effort.

Westcoast to Build B.C. Line

British Columbia's main oil transmission line will be built by Westcoast Transmission Co., Canada's first big inch gas pipeline operator. One factor that led to the choice of Westcoast was this company's intention to build the oil line paralleling Westcoast's present transmission system in the province.

The oil pipeline is expected to be 12¾-inch in diameter and run 500 miles from Fort St. John to Kamloops where it will tie-in with Trans Mountain Pipe Line Co. system which currently supplies Alberta crude in the Vancouver area. Capacity of the Westcoast pipeline is expected to be 75,000 b/d.

The Westcoast oil line will run close to the main towns in central B.C., thus making the province's crude easily available when refinery construction is undertaken. Estimated cost of the pipeline is about $35 million. Completion is expected at end of this year.

Hudson's Bay Report

Hudson's Bay Oil and Gas Co. Ltd., and its subsidiaries had net income, before special credits, of $1,004.00 or six cents per share in 1960 as compared with $2,821,000 or 16 cents per share in 1959. Special credits from sales of properties raised total net income to $1,269,000 in 1960.

The reduction of $1,817,000 in net income, before special credits, was primarily attributable to exploratory expenditures on large blocks of acreage in the Yukon-Northwest Territories and other virtually untested regions where geological conditions are favorable for large accumulations of crude oil and natural gas.

The company's net output of crude oil and natural gas liquids reached a new high in 1960, averaging 22,689 b/d, an increase of 1,435 b/d or 6.8% over 1959. Sales of natural gas averaged 44.3 mmcf/d, slightly less than in 1959. However, sales of natural gas will increase substantially during the next year as development of reserves dedicated to export markets is completed.

During 1960, Hudson's Bay participated in the discovery or extension of nine gas fields and six oil fields, including a six-mile extension of the Clark Lake gas field, a natural gas discovery at Pocketknife, and two crude oil discoveries in the Milligan Creek region, all in B.C. The more important successes in Alberta were a crude oil discovery in the Caroline area eight miles northwest of the Garrington oil field, and two crude oil and natural gas discoveries in the Wintering Hills area.

Pearson Heads Alberta CPA

At the Annual Meeting of the Alberta Division of the Canadian Petroleum Association held last month in the Hotel Palliser, Calgary, G. T. Pearson, president Hudson's Bay Oil and Gas Co. Ltd., was elected chairman of the Canadian Petroleum Association's Alberta Board of Directors for the current year. A. E. Feldmeyer, president and managing director, Canadian Superior Oil of California, Ltd., was elected vice chairman.

New directors elected for two-year terms were: E. A. Galvin, Medallion Petroleums Ltd.; J. F. Hardy, Central-Del Rio Oils Ltd.; C. Hay, Royalite Oil Co., Ltd.; W. C. Howells, Texaco Canada Ltd.; F. M. Jacobson, Amurex Oil Co.; C. S. Lee, Western Decalta Petroleum Ltd.; T. Nitescu, Canadian Fina Oil Ltd.; F. C. Osment, Pan American Petroleum Corp.; E. W. Scott, Union Oil Co. of California; S. W. Shambaugh, Reading & Bates Drilling Co. Ltd.; S. Stewart, Richfield Oil Corp.; and E. Trafford, Colorado Oil and Gas Ltd.

Continuing in office for a further one-year term are: A. G. Bailey, Bailey Selburn Oil & Gas Ltd.; A. F. Beck, Canadian Export Gas & Oil Ltd.; R. W. Campbell, Home Oil Co. Ltd.; A. Clark, The Calgary and Edmonton Corp. Ltd.; A. O. Detmar, Mobil Oil of Canada; G. E. Dunlap, Sun Oil Co.; E. J. Gallagher, The British American Oil Co. Ltd.; G. L. Knox, The California Standard Co.; W. M. Luthy, Canadian Oil Companies, Ltd.; W. D. C. Mackenzie, Imperial Oil Ltd.; C. O. Nickle, Conick Petroleums Ltd.

Exploration Continues Low

Geophysical exploration has continued its rate of 10% decline for first two months of 1961. Only 92 crews were at work in February, down from 102 in February 1960. Active winter season is practically over, and there is strong probability that 1961 will set another new low for past 14 years at about 600 crew months. Total in 1960 was 675 crew months.

British Columbia CPA Elects

The British Columbia Division of the Canadian Petroleum Association has elected the following 1961 executives: chairman of the board, Kelly H. Gibson, Pacific Petroleums Ltd.; vice chairman, E. W. Scott, Union Oil Co. of California; and J. H. Van de Venter, Western Natural Gas Co., Inc.

The following were elected to the board of directors for a two-year term of office 1961-62: Kelly H. Gibson, Pacific Petroleums Ltd.; F. C. Osment, Pan American Petroleum Corp.; G. T. Pearson, Hudson's Bay Oil and Gas Co. Ltd.; John S. Poyen, Imperial Oil Ltd.; and J. H. Van de Venter, Western Natural Gas Co., Inc.

Elected for a one-year term were: F. Brett, Sinclair Canada Oil Co.; K. R. Joynt, Mobil Oil of Canada, Ltd.; S. T. McCardell, Texaco Exploration Co.; W. F. Mugler, Richfield Oil Corp.; and E. W. Scott, Union Oil Co. of California.

Namao Unitization Plans Set

Unitization of an 1,800-acre tract in the Namao field near Edmonton is expected to be completed in June or July of this year. Major operators, including Canadian Chieftain Petroleums Ltd., Edmonton, Ranger Oil (Canada) Ltd. and Blue Crown Petroleums Ltd., both of Calgary, are proceeding with plans to have the unit in operation.

Formation of the unit means that in addition to oil marketing, the more than 20 interest holders will obtain revenue from the sale of natural gas.

Unique Scrubbing Plant

A completely automatic, natural gas scrubbing plant incorporating a silica gel adsorption unit, the first commercial application of its kind in Canada, has been put into operation at its Leduc "Octave Well" by the Sage Oil Co., a few miles from Edmonton's new airport. Separates and scrubs the flow in a new "Dynamic Adsorption Unit" combined with a "Selective Adsorption Unit." A third unit treats the condensate and feeds it into storage tanks. Results are termed "excellent" by the builders, Canadian Equipment Sales & Service Co., Ltd.

Gas Liquids by Pipeline

Technical survey of Interprovincial Pipe Line Co. by Canadian Bechtel Ltd. concludes that large-volume movement of gas liquids through its crude oil pipe line is feasible. Experimental batch of 100,000 barrels has been transported successfully. Interprovincial has filed tariff of 44 cents per barrel Edmonton to Chicago for volume of 50,000 b/d, says it can extend line easily if business is offered.

Oil Strike by Hunt

Best oil discovery of past two years is Hunt Buffalo Lake 16-27, 1sd 16-27-39-21W4, with 114 ft. net pay zone thickness in Devonian D3 coral reef limestone. Well is 2½ miles northwest of Erskine oil field. Pay zone is thickest in whole reef trend southeast of Leduc field. Initial potential was 323 b/d through restricted choke. Drillstem test gave 1,800 b/d flow. Operator is Hunt Oil Co.

Alberta Revenue Drops in 1960

The Alberta Government took in $113 million from petroleum and natural gas Crown leases, royalties and rentals during 1960. This is $17.7 million less than the previous year.

Total revenue from this industry since 1947 amounts to $1,073,236,490.58, made up of sale of Crown reserves ($564 million); royalties ($245 million) and lease rentals ($263 million).

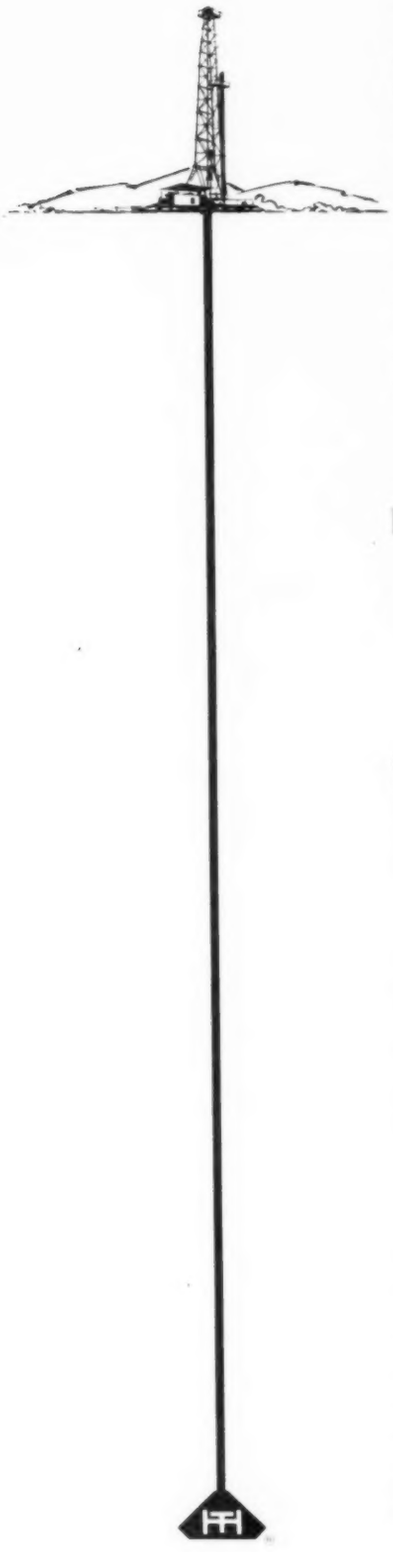
National Supply Appointment

R. Wesley Burns has been appointed regional manager, C. L. Chandler regional manager of sales, Glyn A. Hughes regional manager of services, and E. J. Bird regional manager of merchandising for The National Supply Co., Ltd., with headquarters at Calgary. The changes are part of a comprehensive realignment of National Supply's oil field sales organization. In the United States, six divisional organizations were consolidated into four regional organizations. Eighteen district organizations were combined into eight area organizations.

Personals

SPENCER W. PEPPER, former president of Stewart Petroleums and Progas Ltd., has been named general manager of Petrolane Gas Service (Alberta) Ltd. The new Canadian company is a subsidiary of Petrolane Gas Service, Inc., Long Beach, California, one of the major LP gas marketers in Western U. S.

JOHN A. ARMSTRONG has been named a director of Imperial Oil Ltd. Armstrong is general manager of the producing department, and fills the board vacancy left by the retirement of George L. Macpherson.



go all the way with Hughes

For every formation, Hughes has the bit specifically designed to drill it . . . at a saving to you. So why take chances? There are enough risks in drilling as it is.

Go with the bits that are backed by the most extensive research and greatest engineering experience. Go with the bits manufactured under the most exacting quality controls.

Go with the men who can give you the most accurate information on types of bits, drilling weights, rotary speeds and hydraulics to be used in each drilling area. Go all the way with HUGHES. Bit performance records prove that you'll get there quicker . . . and at lower cost!

HUGHES

Where drilling is toughest . . .

Hughes bits help to keep costs down

Check the areas where hard, high-strength and hard abrasive formations predominate . . . there you'll find operators relying on Hughes bits to keep costs down.

Why? Because Hughes bits through the years have reflected the experience and knowledge gained by Hughes engineers in designing bits to drill the world's *hardest-to-drill* formations.

Your local Hughes representative can help you select the types of bits that will deliver your *most economical footage*. In some cases, it may be one of Hughes' milled-cutter bits. In others, the "Hugheset" bits—RG-7J, RG-1J, or RG-2BJ. The performance of these bits is spectacular where air or airmist is used as the circulating medium.

Or, it may be one of the new "Hugheset" *sealed bearing bits*, now making footage previously undreamed of in formations where bits are exposed to abrasive-ladened fluids.

Wherever you drill, an experienced Hughes representative can help you set up a cost saving bit program.

HUGHES TOOL COMPANY ORIGINATOR

AND WORLD'S LEADING DEVELOPER OF CONE-TYPE ROCK BITS

Free...new FISHING TOOL CATALOG from Wilson

Wilson Supply Company's new 48-page International Division catalog describes all Wilson fishing tools . . . gives complete operational and maintenance information . . . spare parts . . . prices and weights. This new fishing tool catalog is complete in *every* detail—and it's yours for the asking.

Over 55 different time-tested, field-tested fishing tools are described. Each tool is backed by Wilson's 40 years of experience serving the oil and gas industry. In addition to their complete fishing tool line, Wilson's International Division maintains a staff of highly skilled, veteran fishing tool men who are prepared on an hour's notice to travel to any part of the free world with the proper tools for your job.

You'll save rig time and money with Wilson Supply fishing tools. Write today for your copy of the new Wilson Supply International Fishing Tool catalog.

INTERNATIONAL SALES POINTS

TEHRAN SUPPLY COMPANY, P. O. Box 1977, Tehran, Iran. SIDEL, Av. Franklin Roosevelt 30, Rio de Janeiro, Brasil. MARTOCA, Apartado 906, Maracaibo, Venezuela. INTERCOLOMBIANA, LTDA., Apartado Aereo No. 48-64, Bogota, Colombia. INDUSTRIAL AGENCIES, LTD., 14 High Street, San Fernando, Trinidad, B.W.I. INGENAR, S. A., Avenida de Mayo 1439, Buenos Aires, Argentina. COMMONWEALTH DIAMOND TOOLS PTY. LTD., P. O. Box 184, REDFERN, Alexandria, N. S. W., Australia. PROGIPESA, Marqués de Casa Riera, 4, 4°, Madrid, Spain.

WILSON SUPPLY
INTERNATIONAL DIVISION

1301 CONTI ST., HOUSTON, TEXAS
9 ROCKEFELLER PLAZA, NEW YORK, N.Y.
CABLE ADDRESS: WILSCO

Our 40th Year of Service to the Petroleum Industry

Oil & Gas Supplies • Tubular Goods • Production Equipment • Drilling Machinery • Packaged Compressors • Fishing Tools

ANNOUNCING A NEW REFINERY FOR AUSTRALIA

Engineering, Procurement, Construction Assigned by Stanvac to Kellogg

*Standard-Vacuum Oil Company release, February 21, 1961**

WHITE PLAINS, N.Y.—The contract for Standard-Vacuum Oil Company's second refinery in Australia—a 37,800 barrels-a-day fuel products and solvents plant to be built near Adelaide, South Australia—has been awarded to The M.W. Kellogg Company. The award was announced yesterday in Adelaide by Sir Thomas Playford, Premier of South Australia, on behalf of Stanvac's affiliate, Standard-Vacuum Refining Company (Australia) Pty. Ltd.

The refinery will be constructed on a 594-acre site at Port Noarlunga, 14 miles south of the South Australian capital city. Ground will be broken in mid-year, and start-up is scheduled for January 1963.

The new plant will raise Stanvac's crude processing capacity in Australia to approximately 80,000 barrels a day.

Plans call for the use of Persian Gulf crude oil for the production of gasoline, diesel fuels, illuminating kerosene, liquefied petroleum gas, sulfur, asphalt, and solvents—all for the Australian market.

Kellogg's contract covers engineering, requisitioning, and procurement, as well as construction of all process and mechanical equipment, tankage, buildings, and utilities. Major process units will be a crude splitter, vacuum pipestill, hydro-desulfurizer, catalytic reformer and sulfur recovery plant. Tankage will be installed for nearly 2.5 million barrels of crude oil and products.

Maximum use during the construction period will be made of Australian labor, sub-contractors, and suppliers.

Stanvac's entry into petroleum refining in Australia was in 1948, when it built a small lubricating oil plant. This was expanded in 1953 for the production of fuel products. It currently has a throughput capacity of 42,000 barrels a day.

THE M. W. KELLOGG COMPANY

711 Third Avenue, New York 17, N.Y. • A Subsidiary of Pullman Incorporated

Offices of other Kellogg companies are in Toronto, London, Paris, Rio de Janeiro, Caracas, Buenos Aires

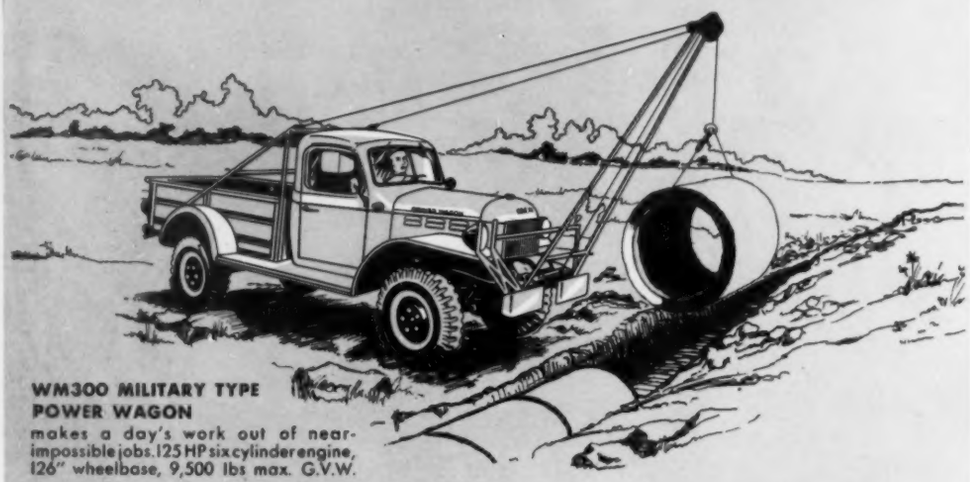
**Even before this date, The M. W. Kellogg Company in New York, and its subsidiary constructing the plant in Australia, were at work on the project.*

CALTEX

Caltex... serving the petroleum needs of more than 70 countries in Europe, Africa, Asia and Australasia

End of the road... start of a

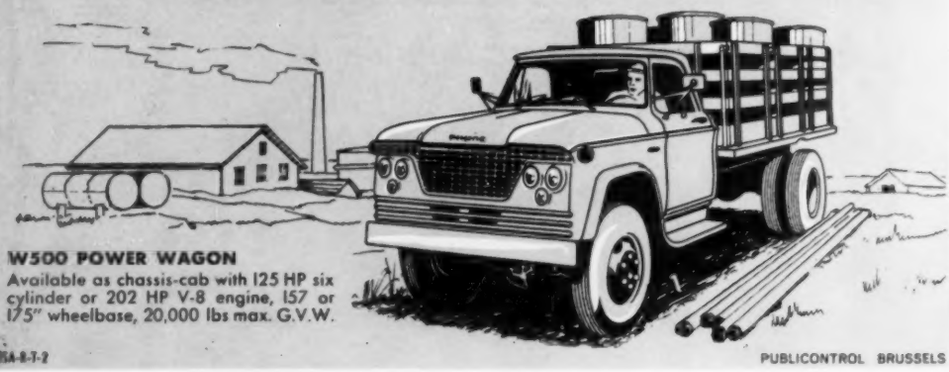
DODGE, FARGO, DE SOTO 4 x 4 Power Wagon



WM300 MILITARY TYPE POWER WAGON
makes a day's work out of near-impossible jobs. 125 HP six cylinder engine, 126" wheelbase, 9,500 lbs max. G.V.W.

PICK-UP RANGE
Utiline and Sweptline models with 125 HP (W300) 140 HP (W100 and W200) six cylinder engine or 200 HP V-8 (W100, W200 and W300). Wheelbases 114" (W100), 122" (W200), 126" (WM300) and 133" (W300). 6,000 to 10,000 lbs max. G.V.W.

W100 TOWN WAGON
Six or eight passenger models with 140 HP six cylinder or 200 HP V-8 engine, 114" wheelbase, 6,000 lbs max. G.V.W.



W500 POWER WAGON
Available as chassis-cab with 125 HP six cylinder or 202 HP V-8 engine, 157 or 175" wheelbase, 20,000 lbs max. G.V.W.

CSA-8-7-2

PUBLICONTROL BRUSSELS

Transportation has always been one of the main problems in the world's oil industry. Extra-rugged vehicles have to be put on the job to carry out and to withstand the tough assignments and the severe tasks involved in oil prospecting and operation.

The Chrysler Corporation has always made an important contribution to the petroleum industry in this field. Dodge, Fargo and De Soto 4 x 4 Power Wagons are the most talked-about trucks of their kind. They have gained a unique reputation built on ruggedness, on exceptional dependability and on outstanding performance. Versatile "extras" such as a power winch with 8,000 to 10,000 lbs capacity, power take-off, transfer case and pintle hook are available. These Power Wagons are especially built to give years of trouble-free service !

CHRYSLER INTERNATIONAL S. A.
GENEVA - SWITZERLAND
P. O. BOX 281 - Mont-Blanc

now

vastly improve your distillate fuels *at extremely low cost*

UOP INHIBITORS AND ADDITIVES FOR TREATMENT OF DISTILLATE FUELS

POLYFLO™ *inhibitor-dispersants: Made in three formulations. Stabilize against thermal changes, color deterioration, sludge and deposit formation.*

DRIACIN® *dispersant-additive: Specially formulated for unstable heating and diesel fuels. Limits growth of colloidal particles, prevents clogging of filters, formation of rust in storage tanks.*

UOP COPPER DEACTIVATORS: *Two grades—80% and 50% active ingredient. Prevent trace copper interfering with action of inhibitors. Minimize color and sediment deterioration.*

No one inhibitor or inhibitor-dispersant can fully and effectively protect *every type* of distillate fuel. Each needs its own proper inhibitor selection, which must be determined on the basis of a comprehensive analysis of the fuel to be treated.

In response to this need, UOP offers a unique and highly valuable service that includes determining your precise inhibitor needs, based upon inspection and study of your fuels. From this analysis, we will determine the best inhibitor or most effective inhibitor blend recommended for each type of fuel you market.

Use of the correct inhibitor or blend of inhibitors for a given distillate fuel assures maximum stability at minimum cost. Reduced concentration of inhibitors also minimizes water absorption.

Refiners with distillate fuel marketing problems will find this service a must!

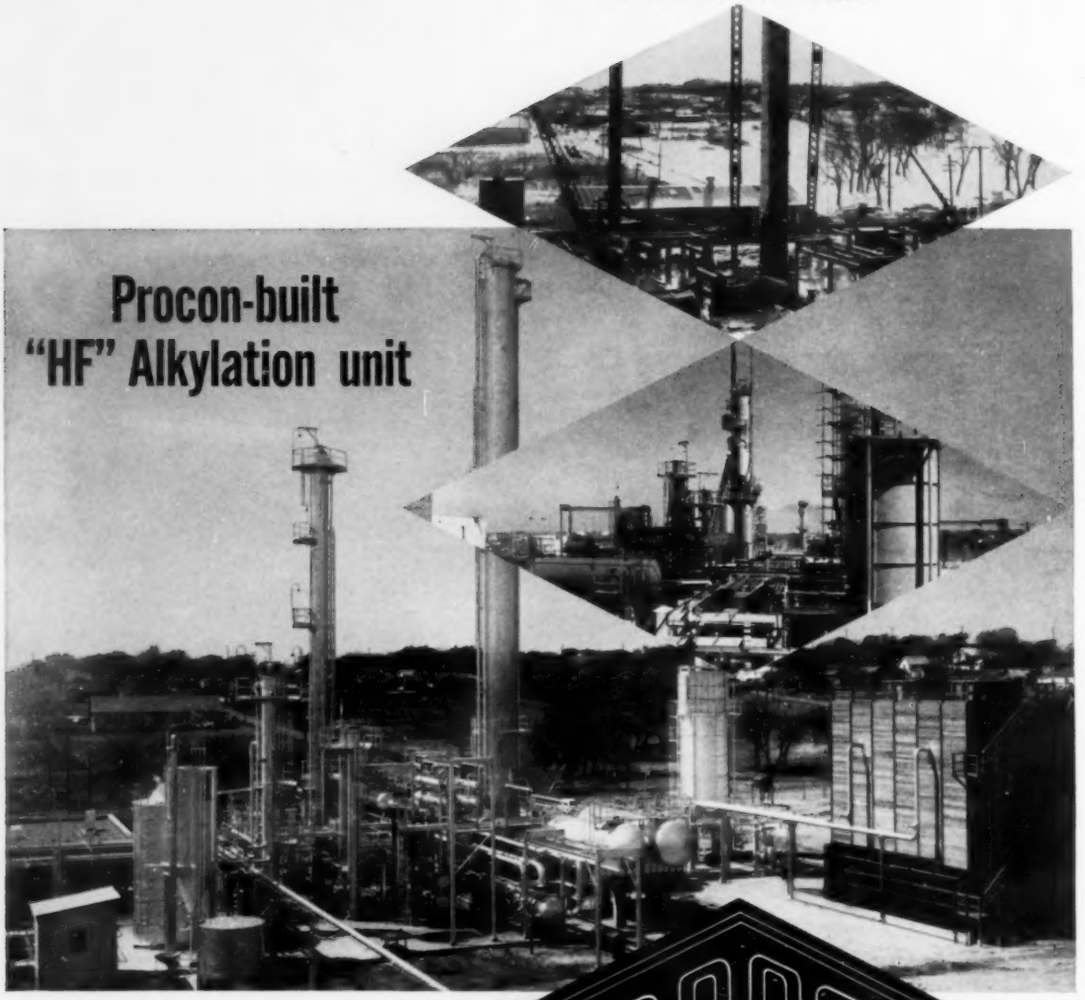
For our recommendations, send your distillate fuel samples to our Products Department—no obligation.

UNIVERSAL OIL PRODUCTS COMPANY
30 Algonquin Road
Des Plaines, Ill., U.S.A.

UOP®

WHERE RESEARCH TODAY MEANS PROGRESS TOMORROW

ON-SITE WITH PROCON



...on-stream ahead of schedule

Maintaining schedule during the construction of a processing unit requires the precise co-ordination and timing of a series of design, engineering, procurement and construction details. But to complete ahead of schedule requires the extras in experience . . . in judgement, that save minutes and days. A right decision . . . a proper procedure . . . a new technique, these are the *experience factors* that help PROCON build better and on time.

Procon completed this "HF" Alkylation unit, built for Midland Cooperatives, Inc., days ahead of schedule.

Midland located in Cushing, Oklahoma, uses the high octane alkylate to supplement its premium gasoline.

Turnaround, unit revamping, one unit or a complete refinery from the ground up . . . whatever your requirement you can trust the entire job to PROCON.

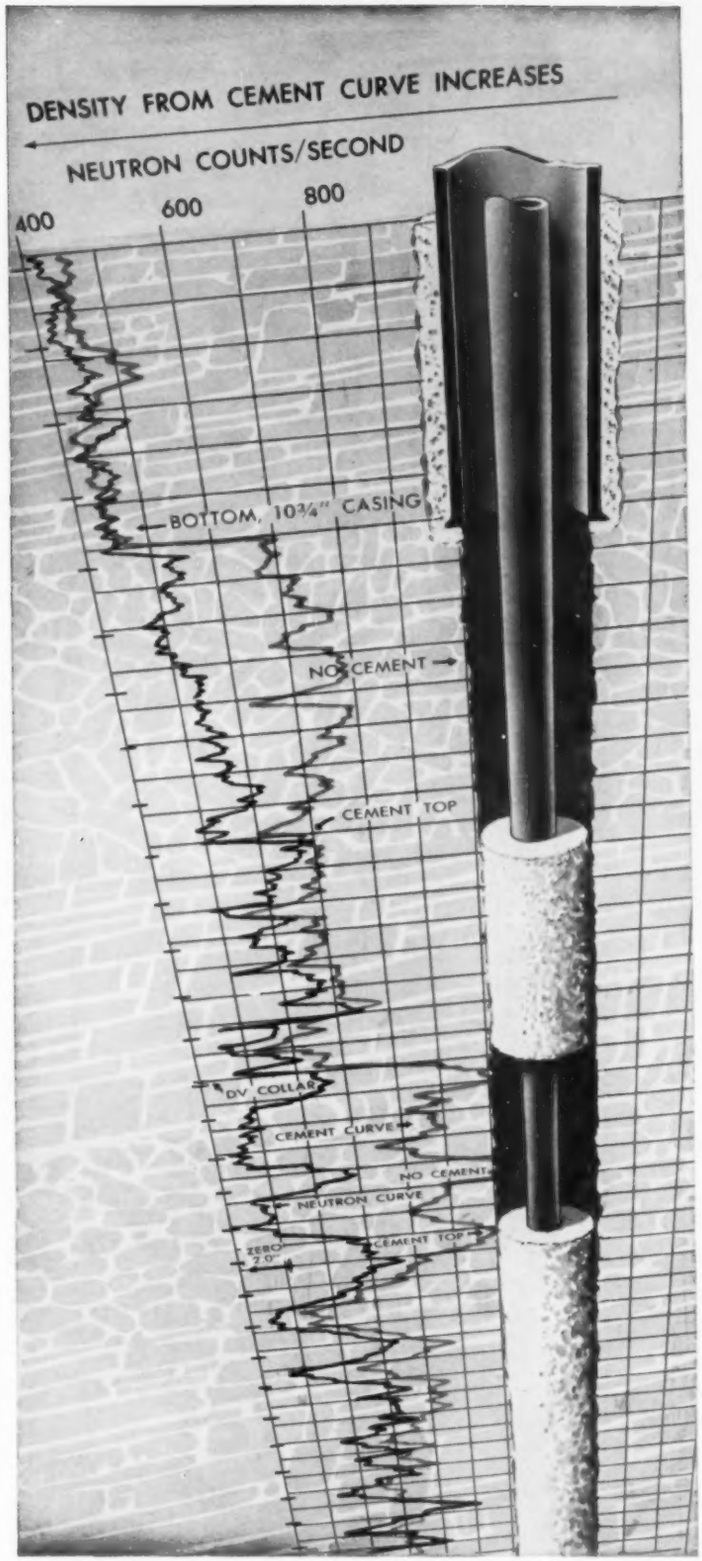
PROCON®

WORLD-WIDE CONSTRUCTION FOR THE PETROLEUM, PETROCHEMICAL, AND CHEMICAL INDUSTRIES

PROCON *Incorporated*

1111 MT. PROSPECT ROAD,
DES PLAINES, ILLINOIS, U. S. A.

PROCON INTERNATIONAL S. A., CHICAGO, ILL., U. S. A.
PROCON (CANADA) LIMITED, TORONTO, CANADA
PROCON (GREAT BRITAIN) LIMITED, LONDON, ENGLAND
PROCON PTY. LIMITED, SYDNEY, AUSTRALIA
PROCOFRANCE S. a. R. L., PARIS, FRANCE
PROCON LIMITADA, SAO PAULO, BRAZIL
PACIFIC PROCON LIMITED, MANILA, P. I.
VICAPROCON, S. A., CARACAS, VENEZUELA



McCullough

NUCLEAR CEMENT LOG

with Scintillometer ®

– lets you SEE

your cement column

Here's an improved cement locating log that accurately "pictures" the cement column in your well. It will identify the presence of the cement column, confirm the quality of the job, locate cement tops, indicate uncemented sections and possibly detect channeling. It is equally effective in new wells or in old wells of any age.

The McCullough Cement Log records a curve which reflects the density of the material behind the casing. Thus, the location and characteristics of the cement column, when it differs in density from the displaced fluid, can accurately be determined.

This log is usually run on the same trip into the well with other nuclear well surveys, thus requiring no extra rig-time. In fact, the cement curve can be one of six separate logs, all revealing different down-hole information, that may be obtained on a single run without coming out of the hole. Also, it is very economical, price-wise, when run in combination with other nuclear logs.

Proved thoroughly effective on hundreds of jobs, the McCullough Cement Log is being adopted as standard procedure for determining the effectiveness of the primary cement job, checking squeeze jobs and for use in future workover or remedial operations.

The Cement Log shown at the left is made up of sections of an actual log run in 5½" OD casing from 3800' to surface. All information shown is exactly as it appeared on the original log.

McCullough

TOOL COMPANY

Los Angeles • Houston • Edmonton

Cable Address: MACTOOL

made the world over

and to the same specification

Caposite amosite asbestos moulded insulation is manufactured under supervision to the same uniform specification in all these countries.

Great Britain
by Cape Insulation & Asbestos Products Ltd.

Canada
by Caposite Insulations Ltd.

South Africa
by Cape Asbestos Insulations (Pty) Ltd.

Australia
by James Hardie & Company Ltd.

France (as 'Isolamiante')
by Isolamiante SA

Italy
by Capamianto SpA

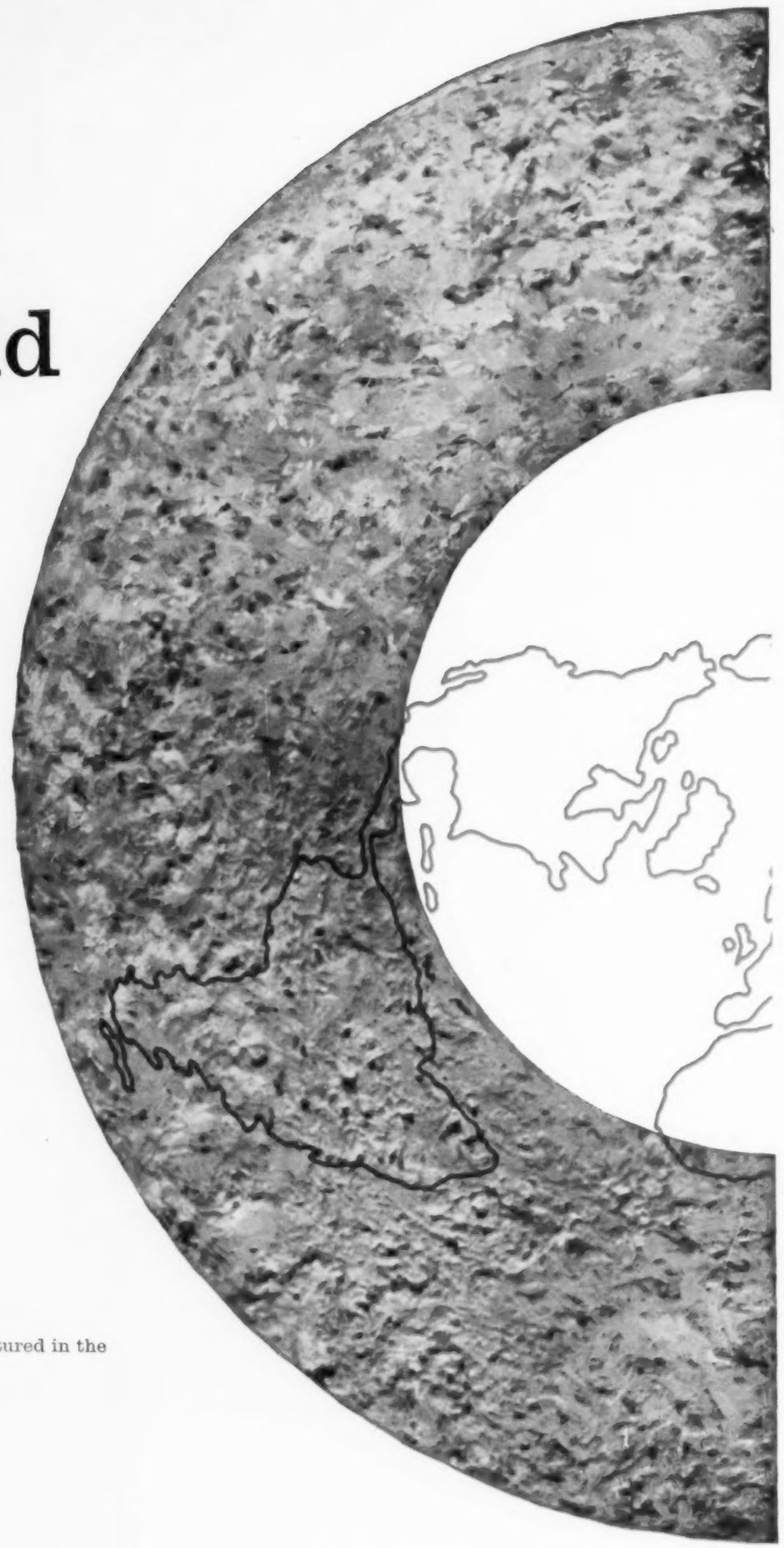
Holland
by J. de Boer & Company

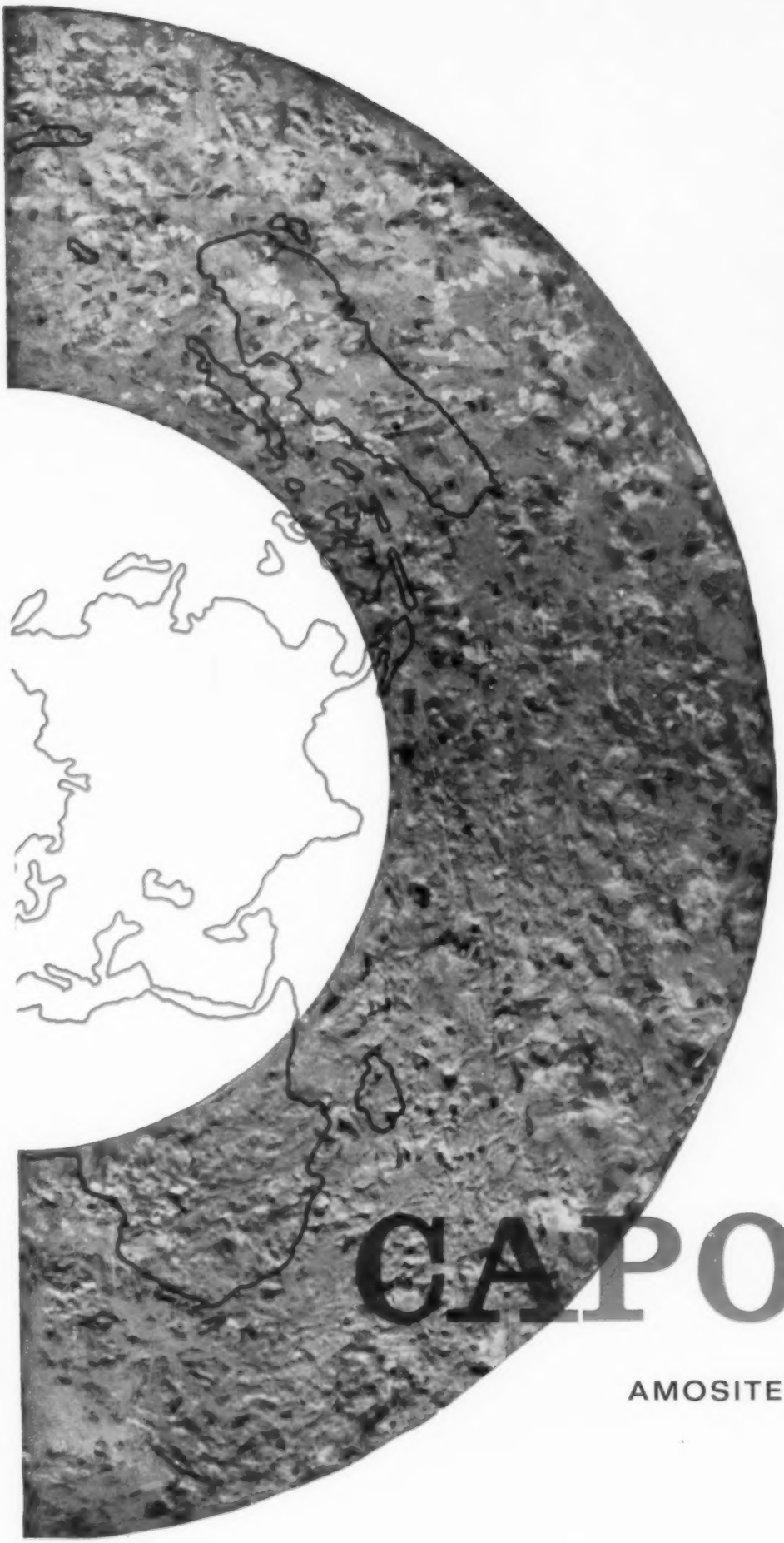
Spain
by Messrs. Eduardo Rosa

Argentina
by Montisol Argentina SRL

Japan
by Nippon Asbestos Company

Amosite asbestos insulation is also manufactured in the **U.S.A.** under the name of 'Unibestos'
by Union Asbestos & Rubber Company





Cape Insulation

& ASBESTOS PRODUCTS LIMITED

114 & 116 Park Street, London, W1
Telephone: GROsvenor 6022
Cables: Incorrupt London.
Enquiries to:
Cape Asbestos (Canada) Limited
200 Bloor Street East, Toronto, Ont.
Capamianto SpA
via Sant' Antonino 57, Turin, Italy.

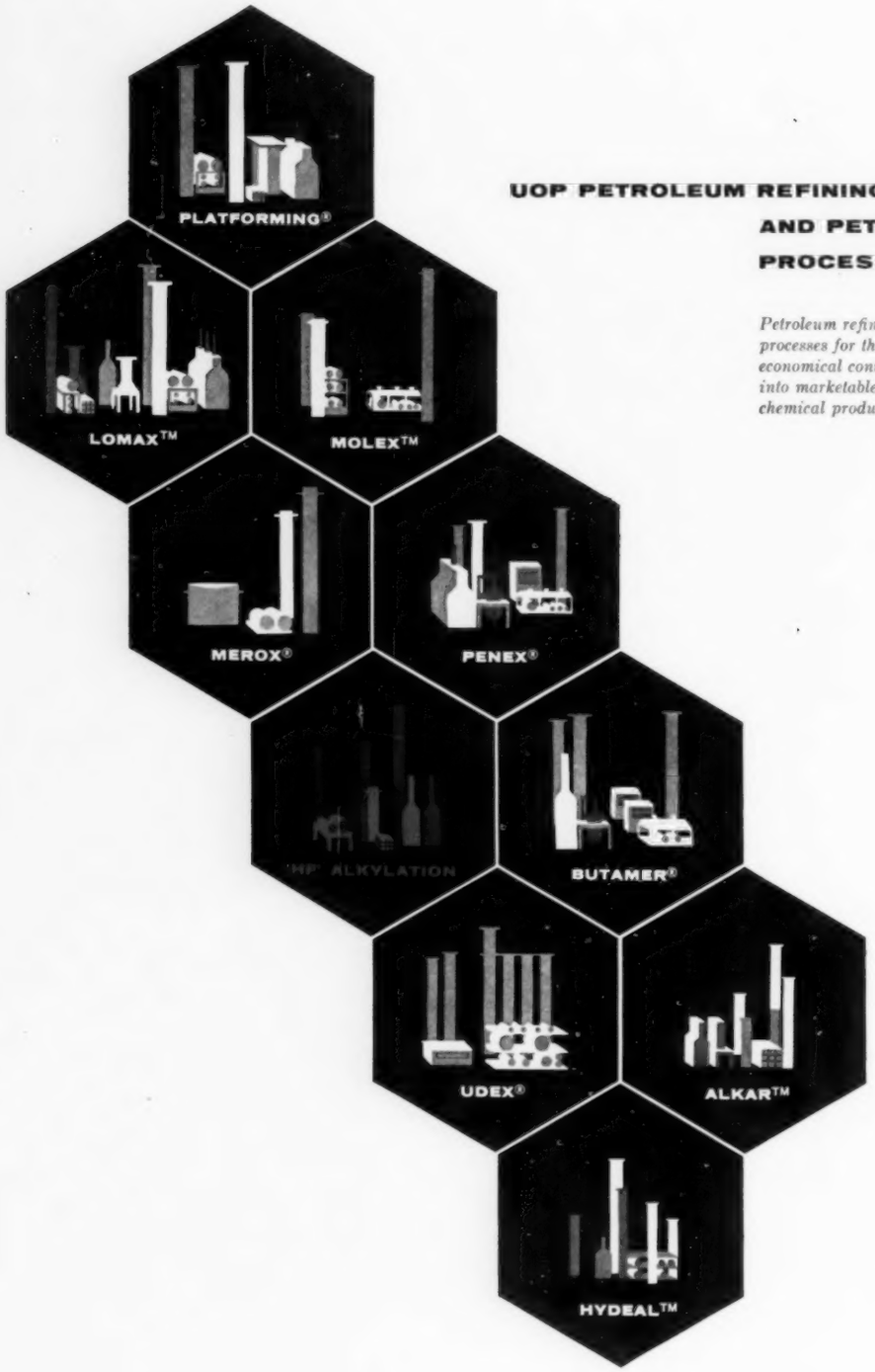
CAPOSITE

REGD.

AMOSITE ASBESTOS INSULATION

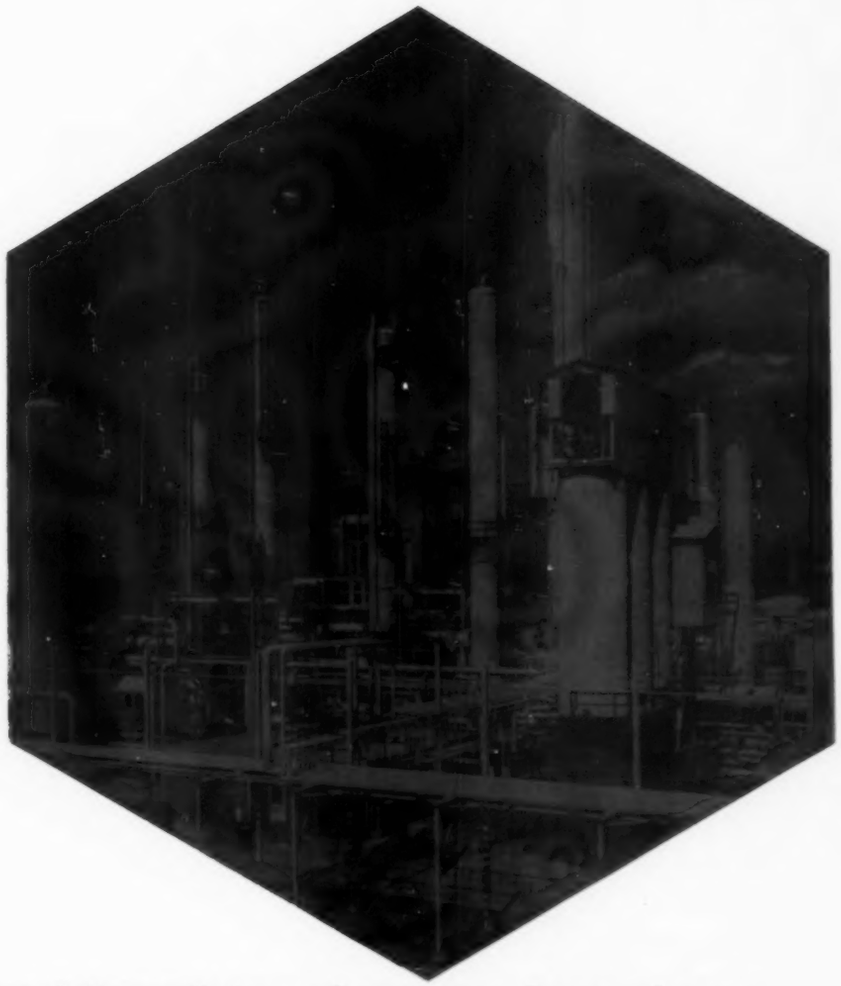
CAPE

7A 3642



UOP PETROLEUM REFINING AND PETROCHEMICAL PROCESSES

Petroleum refining and petrochemical processes for the efficient and economical conversion of petroleum into marketable fuel and chemical products.



now blend in cleaner burning, highest octane components

"HF" ALKYLATION gives refiners a blending component that combines the ideal qualities of a clean burning fuel that gives smooth engine performance with high octane number. Often refiners find themselves pushed into an economic corner in producing gasolines that burn clean, efficiently, and give maximum power. "HF" Alkylation is a catalytic process that produces an isoparaffinic fuel component that burns with a minimum of carbon deposit . . . greatly reduces surface ignition and consequent rumble . . . and is ideally suited to the auto engine of today.

The UOP-developed "HF" Alkylation process combines olefins such as propylenes, butylenes and amylenes with an isoparaffin, usually isobutane. The product formed, alkylate, is a mixture of branched chain hydrocarbons of higher molecular weight. It is widely used in producing high octane aviation gasoline, as well as an anti-rumble component in motor fuel.

UOP also offers Sulfuric Acid Alkylation for special situations where the refiner's economic, supply, or production situation may give this process a greater profit potential.

With more than a score of different processes UOP can offer you the most profitable method for the processing of petroleum. Let UOP engineers evaluate your processing needs now.

WHERE RESEARCH TODAY
MEANS PROGRESS TOMORROW

UOP®

UNIVERSAL OIL PRODUCTS COMPANY
30 Algonquin Road, Des Plaines, Illinois, U. S. A.

Werkspoor does the assembling too!

2,000 men are on hand to work for Werkspoor's Construction Department. A permanent team of key personnel and the most extensive range of equipment are your guarantees that every job, large or small, will be handled in the best way and in the shortest possible time. Complete factories and plants, boiler installations, buildings, bridges and pipelines, either made by Werkspoor or by other manufacturers, are assembled by these experts in all parts of the world.

WERKSPOOR

WORKS AT UTRECHT (NETHERLANDS)

MANUFACTURERS - CONSTRUCTORS - CONTRACTORS

FOR EVERY PRACTICAL PURPOSE, this is the best swivel joint in the world. Its design basis is not the product of a limited applicability device, but rather of studied consideration for all applications. It is built to do the best job, with the least maintenance, for the longest period of time. It is a **CHIKSAN** Swivel Joint.

fmc

CHIKSAN COMPANY – General Offices: Brea, California • Well Equipment Mfg. Corp. Division (Weco Unions, Hamer Valves) • Chiksan International • Chiksan of Canada Ltd.

Offices and Representatives in Principal Cities of the World

by William C. Uhl
Processing Editor

Highlights of the month—a new and economic technique for desulfurizing natural gasoline by use of molecular sieves; and electronic computer saves 5 to 6% on total construction costs in a test on design of a chemical plant

An economic desulfurization technique for natural gasoline through use of molecular sieves was reported last month at the Dallas meeting of the Natural Gasoline Association of America. It is said to overcome the primary disadvantages of presently employed sweetening methods.

A plant designed for sweetening 300,000 gal/day of de-ethanized natural gasoline containing from 900 to 2,300 ppm of sulfur, and using 73,000 lb of Type 13X molecular sieves in two fixed bed adsorbers, was the basis of an economic study reported in the NGAA paper by Kenneth H. Bacon of Warren Petroleum Corp. and Alfred M. Henke of Gulf Research & Development Co.

The following sulfur levels were reached for fractions of the gasoline: C_3-C_4, 0.3 grains per 100 scf (in terms of total sulfur), iC_5 and nC_5, and heavier, 3 ppm mercaptan sulfur.

The process is relatively simple, involving percolation of the gasoline stream through an adsorber containing a bed of the sieves, followed by fractionation of the percolate. Two adsorbers are run cyclically, with the second on a regeneration phase while the first is onstream with the gasoline.

The economics depend, of course, on the prices of the sieves (P in dollars) and sieve life (L in years). Investment amounts to \$75,000 + 73,000P, and annual operating cost is \$64,000 + 73,000P/L. The process is economically equivalent to a caustic solutizer process when P/L is equal to \$0.54 per lb-yr. At a cost of \$1.50/lb of molecular sieves, this process is equivalent to the caustic process if the sieves have a life of 2.8 years.

Based on commercial processes in which sour propane and butane streams from natural gasolines are sweetened by adsorption on 13X sieves, life spans of this length and longer are promising. In these, cyclic operations of six months' duration have been carried out with little reduction in efficiency of the molecular sieves. To date, oxidative regeneration to burn off constituents not desorbed by the hot natural gas regeneration has not been required.

Efficient desulfurization of natural gasolines or their fractions is necessary to permit their use in motor gasolines of higher octanes and as charge stock for catalytic conversions. The inability to sweeten portions of natural gasolines to meet customers' demands has caused refiners to suffer losses in selling price.

Caustic and copper sweetening tend to be somewhat limited in product purity and may require multiple processing. Caustic processes, being corrosive, require high materials cost and are a hazard to personnel. A solutizer solution is needed to sweeten pentanes and heavier, and the propane portion must be dehydrated. Copper sweetening converts mercaptans to disulfides, but though products are sweet, their sulfur content is unchanged. Lead susceptibility is not affected.

Because of the importance of sieve life to economics, work is continuing on tests of regeneration techniques, the authors said. Several are possible, and one which includes recovery of the sulfur compounds is as follows:

(1) Downflow draining of the column under adsorption pressure and temperatures at the same liquid withdrawal as during adsorption.

(2) A short downflow purge with an inert or natural gas to remove most of the remaining unadsorbed natural gasoline.

(3) An upflow purge of hot inert or natural gas. The gases flowing from the top of the column are sent to a condenser in which the sulfur compounds are recovered.

(4) A continued upflow purge of the hot gases at 550 to 700F with the condenser being by-passed.

(5) A downflow cooling of the adsorbent using sweetened natural gasoline.

A system of logic by which an electronic computer is used to design the most efficient plant for any type of chemical has been devised by a team of Shell research engineers and mathematicians.

In a final test, the computer designed an ethylene oxide plant that would cost from \$250,000 to \$600,000 less to build than the best previous design of the group of engineers. This savings represents 5 to 6% of total construction costs. The design also reduced operating costs of the plant between 5 and 10%.

Similar savings were found in tests of the system on a polyisoprene process and on the design of gasoline plants.

Called CHEOPS (Chemical Engineering Optimization System), the system is set up to handle mathematical models of each of the chemical processing units, which are then tied together by equations governing the flow of all chemical streams that could possibly pass through the plant complex.

The computer is fed three types of information:

(1) Which units are needed to produce a given chemical and the route by which streams should flow between the units.

(2) The best available information on the process, including advice to ignore impractical situations, for example, reaction temperatures which would melt steel.

(3) Factors which the computer can vary in developing the most economic design; for example, temperature, pressure, and the like.

Then, operating on the basis of questions from CHEOPS, the computer moves step-by-step to the optimum design. Occasionally, CHEOPS may send the human technologist back to the laboratory for more information. In some design studies, it has found a promising combination of variables that was not tried during the process development stage. In this situation, it asks for more data on the combination.

The system can also adapt the design of a plant to any unforeseen change in construction plans. If a company had to change the location of the projected plant from a hot to a colder climate say for market reasons; CHEOPS could redesign the cooling towers, heat exchangers, and other equipment in a couple of hours so as to take advantage of the cooler climate. In normal or conventional practice, a company would change only a few pieces of equipment because the cost of a major redesign would outweigh any savings in construction.

The Shell research team is now working on a similar program for application to petroleum refineries.

What's New in Processing Plants

A new \$1.2 million, 3,000 b/d refinery under construction at Hassi Messaoud, Algeria, is scheduled to go into operation in June. Cost is being shared by S. N. Repal and CRAN (Cie de Raffinage en Afrique du Nord). Lummus Co.'s French subsidiary is handling the construction.

• • •

Soc. Industrielle Belge des Petroles has a two-year, \$30.8 million expansion program at its Antwerp, Belgium refinery (owned jointly by British Petroleum and Petrofina), increasing crude capacity to about 160,000 b/d from its present 80,000 b/d. Among major new units to be built: a 100,000 b/d crude still with an associated gas recovery unit to increase LPG output; a 9,000 b/d catalytic reformer, a 10,000 b/d hydrofiner, and a 60 ton/day sulfur plant. In addition, the 12,000 b/d catalytic cracking unit is being increased to 15,000 b/d.

• • •

Initial site preparation work has begun for the first refinery in Northern Ireland, a 23,000 b/d, \$22.4 million plant being built by British Petroleum at Sydenham, near Belfast, and scheduled for completion late in 1963.

• • •

Completion to coincide with start-up of the Karlsruhe-Marseilles crude oil pipeline is planned by Deutsche Shell A.G. for the 40,000 b/d refinery it will start building on a 333-acre site near Ingolstadt, Bavaria, Germany, before the end of this year.

• • •

The Yugoslavian government plans a 23,000 b/d refinery at Pancevo, near Belgrade, to be completed within five years.

• • •

Capacity and investment involved in the new refinery slated for completion sometime in 1962 near Algiers, Algeria, have now been disclosed as between \$30 and \$40 million, and 50,000 b/d. Plant is to be designed to handle sweet Middle East and Venezuela crudes as well as Sahara oil. Participating in the venture are Cie Francaise des Petroles and an affiliate (32%); Shell (18%); Jersey Standard (17.6%); British Petroleum (10.4%); SN Repal (10%); Mobil (6%); and Beryl Algerie (6%).

• • •

Refineria Conchan-California S.A. has awarded the Fluor Corp. Ltd. a contract for more than \$1 million for the engineering and procurement of a 6,659 b/d crude unit and auxiliary facilities at Conchan, Peru. Principal owner of the refinery is a group of prominent Peruvians headed by Dr. Mariano Prado. Standard Oil of California is a part owner and engineering agent.

• • •

Standard-Vacuum Oil Co. has awarded the contract for its second Australian refinery to M. W. Kellogg Co. A 37,800 b/d plant, it will be built on a 594-acre site at Port Noarlunga, 14 miles south of Adelaide, with completion scheduled for January, 1963, and it will raise Stanvac's crude capacity in that country to about 80,000 b/d. Major process units include atmospheric and vacuum distillation, hydrodesulfurization, catalytic reforming, and sulfur recovery. Plan is to operate on Persian Gulf crude oil and produce gasoline, diesel fuels, kerosine, LPG, sufur, asphalt, and solvents, all for the Australian market.

• • •

British Petroleum has underway a \$1.54 million project at its Aden refinery to increase crude capacity to 136,000 b/d from its present 110,000 b/d, by modification of existing equipment. Completion is expected by end of 1961.

(Continued on page 34)

Airlift Australia

AUSTRALIA'S Snowy Mountains Scheme has presented some unusual challenges to BP as sole supplier of petroleum products. Some of these challenges have been met in unusual ways, such as fuel drops from aircraft.

This gigantic project, midway between Sydney and Melbourne, with its great dams, power stations, and miles of tunnels and aqueducts, is designed both to provide hydro-electricity and to divert irrigation water westwards into the parched plains.

British Petroleum is proud to be associated with the Snowy Mountains Scheme, one of the world's greatest engineering undertakings.

BRITISH PETROLEUM

BP

Danish Shell has bought land at Frederica, 110 miles from Copenhagen, Denmark, as a possible refinery site. No plans have yet been announced, although reports suggest a possible $30 million plant.

• • •

The Spanish government has approved "in principle" a proposal by Ohio Oil Co. to build a 25,000 b/d refinery on northern coast of Spain.

• • •

Burma Oil Co. (1954) Ltd. is accepting bids for the design and construction of a 14,000 b/d crude still for its Syrian refinery.

• • •

The Pakistani government expects the three major marketers—Shell, Caltex, and Stanvac—to establish at least four new lube oil blending plants, although national inland consumption is only about 12,000 ton/yr. Licenses for imports of packaged products have now been cut off.

• • •

An automated, 5,000 b/d catalytic cracking unit, the first in Romania, has gone onstream at the Onesti refinery.

• • •

Bid by Phillips Petroleum Co. was favored out of 12 that had been tendered for building a 28,000 b/d refinery in Thailand. Initial investment is to be $35 million. Thai government is to take over plant after 10 years operation by the company.

• • •

Petrobras is awaiting approval by new Brazilian administration for a 25,000 b/d refinery at Belo Horizonte (with a 300-mile crude line from Rio de Janeiro). Project already has approval of National Petroleum Council of Brazil.

• • •

The capacity of Misburg, Germany, refinery of Gewerkschaft Erdoel-Raffinerie Deurag-Nerag has been raised to 30,000 b/d from existing 20,000 b/d.

• • •

Ampol Petroleum Ltd. plans a $40 million refinery at Port Alma, Queensland, Australia. Company has a 4,000-acre site.

What's New in Petrochemicals

Petroquimica Argentina S.A. has won Argentine government approval for its $70 million petrochemical complex to be built at San Lorenzo, on the Parana River 250 miles northwest of Buenos Aires. PASA is composed of a group of five USA companies: Cities Service, Continental Oil and US Rubber each will put up 24% of the capital; Fish International 15%, and Witco Chemical 13%.

• • •

Socony Mobil's newly formed Italian affiliate, Mobil Chimica Italiana SpA, will build a large petrochemical plant at Naples with an estimated initial output of 39 million gal/yr, of which over 75% will be benzene and orthoxylene production, and to operate on raw materials from the adjacent refinery of Mobil Oil Italiana.

• • •

Israeli and foreign interests plan three petrochemical plants near the state-controlled refinery at Haifa at a cost of $17.5 million.

• • •

Cabot Carbon Corp. will construct a $4 million, 13,000 ton/yr carbon black plant at Campana, Argentina, north of Buenos Aires.

• • •

W. R. Grace & Co.'s Chemical Division will soon begin construction of a plant near Bogota, Colombia, to produce phthalic anhydride and plasticizers, presently imported, as well as to increase naphthalene production, now made at the company's Carboquimica plant.

• • •

Shin Nippon Chisso Hiryo KK of Japan has signed a non-exclusive license agreement with Cosden Petroleum Corp. under which Cosden will provide process and technical know-how for polybutylene manufacture. The required approval by Japanese government is expected shortly.

• • •

United Carbon Co. has purchased a 45-acre site 85 miles north of Los Angeles for a new 64 million lb/yr carbon black plant, to be engineered and built by The Lummus Co. and in operation late in 1961.

• • •

Goodrich-Gulf Chemicals Inc. has awarded a contract to Blaw-Knox Co. for construction of its cis-polybutadiene facility at Institute, West Va.

Ohio Oil Co. and Dow Chemical Co. have made a long term agreement whereby Ohio will provide Dow with some 20 million gal/yr of benzene-toluene mixture, starting in mid-1962. Detroit refinery of Aurora Gasoline Co. (an Ohio Oil subsidiary) has a multimillion dollar expansion underway to install benzene production facilities, and Dow is constructing a unit at Bay City, Mich., for conversion of the mixture to benzene. Buckeye Pipe Line Co. is building a 42-mile extension to its network, between Flint and Bay City, at cost of $1.7 million, to transport Aurora's product to Dow. Ohio Oil will also ship naphtha to Detroit from its Robinson, Ill., refinery via existing pipelines.

• • •

Manufacturers of lead anti-knock additives in the USA has grown to four. Stepan Chemical Co. of Northfield, Ill., has entered a working agreement with Soc. Lavorazioni Organiche Inorganiche (SLOI), an Italian concern that has been producing these materials for 25 years in the European market. SLOI will furnish Stepan with design and technical information, and will train plant operators.

• • •

Polymer Corp. plans a 20,000 ton/yr polybutadiene plant at Sarnia, Ont., with completion sometime in 1962, the processing to be under licenses from Prof. Karl Ziegler, and from Goodrich-Gulf Chemicals Inc.

• • •

The world's first naphthalene produced in commercial quantities from petroleum stocks began moving from Ashland Oil & Refining Co.'s new plant near Ashland, Ky. in February. New unit uses Hydeal process (developed by Ashland and licensed through Universal Oil Products), and has an estimated production capacity of 75 to 100 million lb/yr of naphthalene, and as much as 6 million gal/yr of benzene.

• • •

The Indian government has approved construction of an 80,000 ton/yr fertilizer plant by California Chemical Co., International Minerals and Chemical Corp., and E. J. D. Parry at Madras, to operate on raw material from Caltex refinery at Vizagapatam.

• • •

Indonesia will build a 100,000 ton/yr, $38 million urea plant at Palembang, Sumatra. Morrison-Knudsen of USA will design, construct, train operators, and handle start-up.

• • •

A consortium comprising United Carbon Co., Manufactura de Papel, Inversiones Dosco, and Grup Tecnico de Promocion Industrial, with an Export-Import Bank credit of $1.4 million, will build a 20 million lb/yr carbon black plant at Valencia, Venezuela. Lummus Co. is the contractor.

• • •

The Esso group in Sweden has obtained a license from Montecatini to manufacture and sell polypropylene in the Scandinavian market from the petrochemical plant it will complete in mid-1963 at Stenungsund.

• • •

A plant using the Scientific Design Co. process to make maleic anhydride is scheduled to go onstream in 1962 at Selzaete, Belgium, for Soc. Chimique de Selzaete.

Solar Nitrogen Selects Catalytic

Catalytic Construction Co. has been selected by Solar Nitrogen Chemicals Inc. to perform maintenance services under contract on the firm's soon to be completed ammonia-urea plant at Atlas, Mo. Solar is owned equally by Atlas Powder Co. and the Standard Oil Co. (Ohio). The plant will be operated by Atlas.

This is the 23rd industrial plant that Catalytic Construction now has under continuous contract maintenance. Specially skilled engineers and craftsmen will be provided for both routine mechanical work and peak forces needed during unit turnarounds.

Instrumentation of Panama Refinery

Central America's first large refinery, under construction near Colon, Panama, for Refineria Panama S.A., is to be equipped with solid-state electronic instrumentation developed by Minneapolis-Honeywell Regulator Co.

Miniature, two-wire "ElectriK Tel-O-Set" units will include indicating, recording, controlling, and transmitting devices. In addition, M-H will supply control valves and valve actuators, thermocouples and a console on which any of the 168 process temperatures can be indicated by flipping a switch.

Being built by Bechtel Corp., the $30 million plant will include a crude still, visbreaker, cat reformer, desulfurizer, asphalt and boiler plants. It will be completed early in 1962.

Dresser Provides Computers

Two more analog computer/controllers from Dresser Electronics, Houston, will be in operation during this second quarter, according to a company announcement.

One unit has been sent to Tecnica per l'Automazione Industriale, Milan, for use by a butadiene processor in Italy. The other instrument will go to Texas City Refining Inc., Texas City, Texas, for use on a stripper column. Both devices are similar in design, in the $10,000 class, and designated "CM-3 Analog Computer." They use solid-state logic circuits and magnetic amplifier circuits. Overall computing accuracy is better than 1%.

Information on Ammonia Process

A new brochure describing production of ammonia via steam reforming has just been published by The M. W. Kellogg Co. A highlight of the 12-page booklet is a presentation of direct operating costs and utility costs for ammonia production using the Kellogg Process in five major geographical locations of the USA.

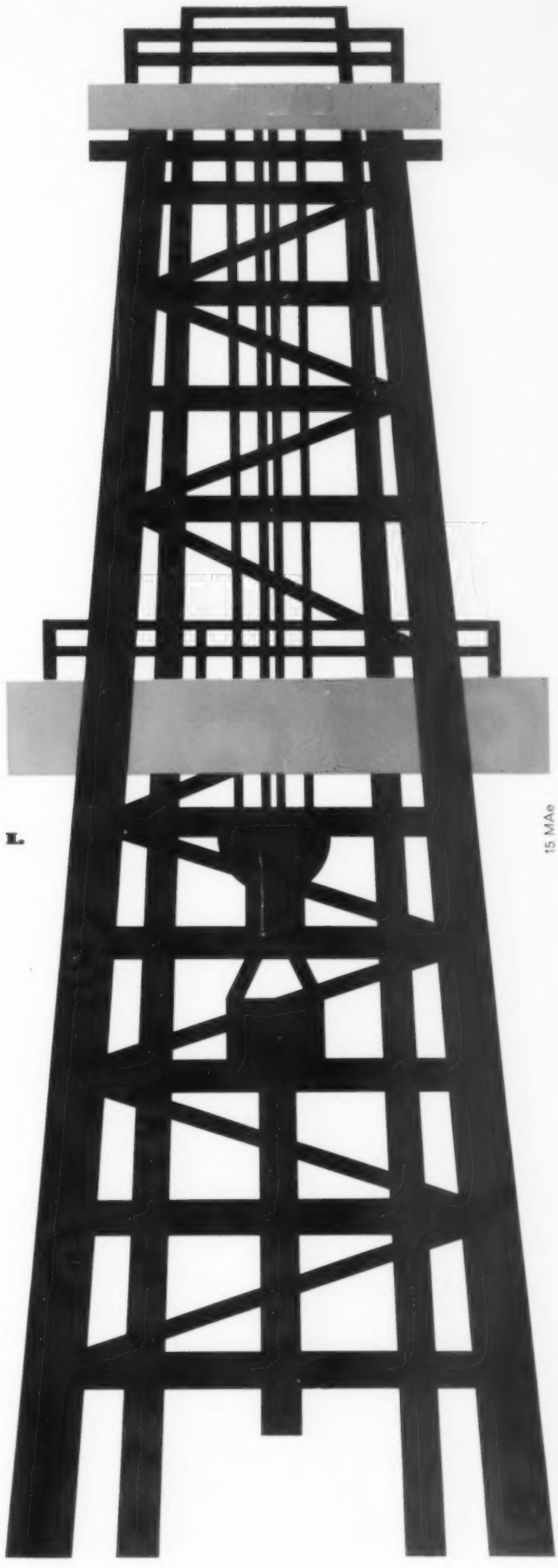
Process descriptions for both one- and two-stage operations are included, as well as an empirical formula developed by Kellogg engineers which permits the calculation of the quantity of feedstock required for any given rate of ammonia production. Copies are available from Kellogg at 711 Third Avenue, New York 17, N. Y., or Kellogg subsidiary and affiliate offices in Toronto, London, Buenos Aires, Paris, Rio de Janeiro, and Caracas.

Offers Tank Inspection Free

A free inspection plan for storage tanks, checking 73 points, is being offered refinery operating personnel by Graver Tank & Mfg. Co., East Chicago, Ill.

The offer is made throughout the USA, and the company's specialists will submit a complete written data sheet on every tank inspected. Graver points out that detection of deficiencies before trouble occurs can save costly maintenance charges because low-cost repairs are indicated in the early stages. If any repair work should be necessary, Graver will make a fair and competitive bid, with flexible financing.

Mercedes-Benz are on the job, putting punch into drill rigs on the world's oilfields. They bear the Mercedes-Benz star - the symbol for their performance-proved features: robustness, high duty in continuous operation and low weight.

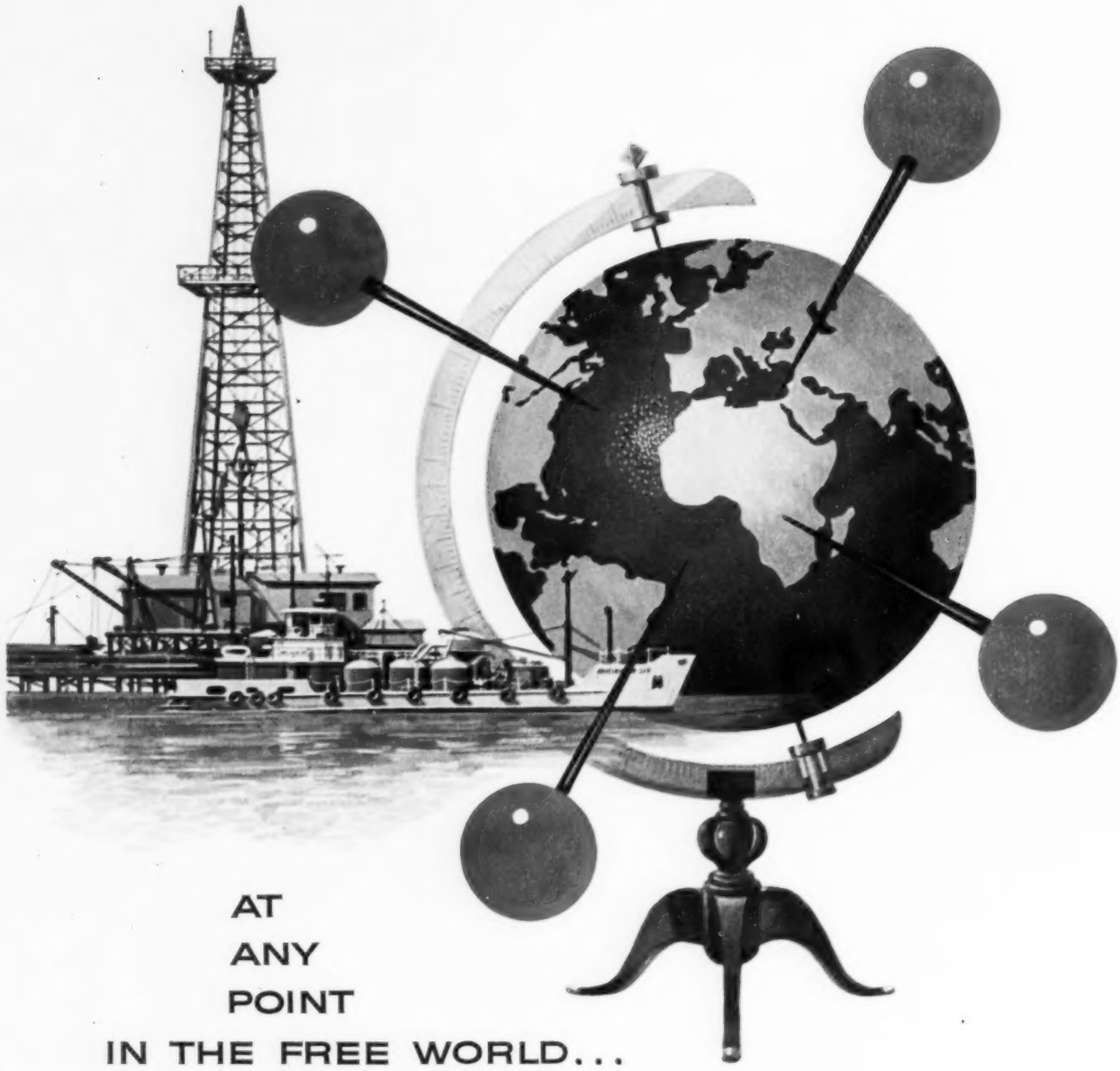


15 MAe

MERCEDES-BENZ DIESEL

Your star performer

Our technical literature MX 22 will give you the full story. Why not write for it now? We'll reply by return of mail. Daimler-Benz AG, Stuttgart-Untertürkheim, Verkauf Motoren/Export



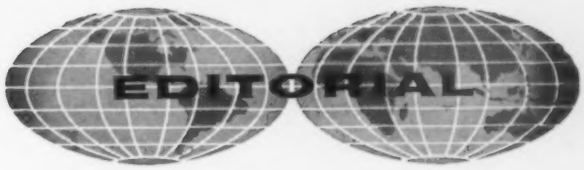
AT ANY POINT IN THE FREE WORLD...

As offshore drilling expanded from the coasts of the United States to the waters of the free world, Halliburton expanded its operations to provide its services wherever they were needed.

Halliburton has left nothing undone to provide these offshore rigs in the far-flung waters of the world with the same excellence of products and services oil men have relied on for over 35 years.

As new pins are added to the offshore map of the Free World, they will also be pointing to new locations for Halliburton service.

Halliburton COMPANY • DUNCAN, OKLAHOMA



OIL IS INTERNATIONAL

Government participation in the oil industry has grown during the past few years, and the World Bank commissioned an impartial study of the relative efficiency of government enterprise in this field. A distinguished international oil expert, Mr. Walter J. Levy, was chosen who has acted as consultant to many governments and major companies. His recent report to the member countries of the World Bank is the first objective study in this field. It has not been released to the public, but its principal conclusions have been reported in the press.

In his report Mr. Levy defines the oil industry as dependent on a broad basis of experience, exposure, and money. The report is particularly significant now, when almost every major government oil company in this hemisphere seems to be in difficulties.

At the root of their difficulties lies centralized decision-making and the lack of competition. Government entities may have money, as witness the expenditure of over $300 million in Brazil by the government's Petrobras for exploration over the past five years or so. They can have experience too, since it is possible to hire technicians with highly expert backgrounds. Without the varied backgrounds and judgments of a competitive group, however, the money goes down the drain with nothing to show.

Oil finding is not an exact science. This is difficult for a person not educated in the oil industry to appreciate, but any geologist who has attempted to define what lies two or more solid miles below his feet will confirm that statement, and solemnly say "Amen!"

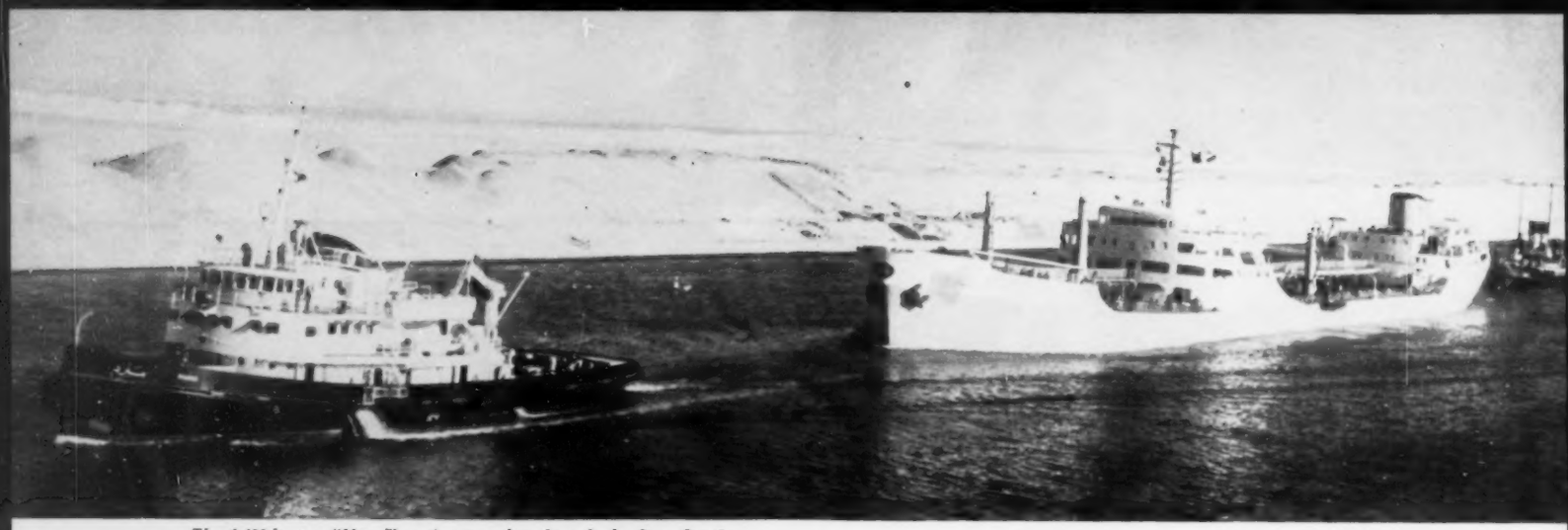
Based on this vagary of the industry, one story is more famous than any other. It varies from the director of a famous company who, when discussing long ago the merits of a concession over Saudi Arabia, puffed a cloud of pipe smoke and made the reverberating statement "Gentlemen, there is no oil in Saudi Arabia." The same type of story is found everywhere. In Canada, according to the story, an old man had a dream that oil was to be found in his pasture, "down by the big tree." His grandson drilled after a lot of prodding by his grandfather, and found one of Saskatchewan's largest fields.

Thousands of variations of this story exist in every oil-producing state of the United States. Many a representative of a major company will confess ruefully that he was in on the meeting where they decided to abandon some property, only to have it successfully drilled later by some wildcatter with enough faith to lay a few dollars on the line and enough blarney to entice others to do the same. A great share of the oil in the United States has been found on properties condemned by others, and as it works on a small scale in the areas of the world where private property in oil exists, so it works on a large scale in the international sphere. It can be said that only in those countries where a multiplicity of companies are allowed to compete with each other are the chances of finding oil very good. And even there they have no assurance of success. For examples of successful oil hunts, Libya is the most outstanding. There, over 25 companies are participating in the oil hunt, but only two have made significant finds. Alaska, Canada, Venezuela, Colombia—all these fall in the category of success (sometimes limited) for a few after a long hunt by many.

There are examples of failures as well. Guatemala, Peru, Australia, Papua, Ecuador, all these are failures so far but there is one important fact to remember: into each of them went a great deal of money, time and expert work. Much more money and expertise, in fact, than could have been put in by the government of any one of these countries.

In view of these necessary factors, it would appear that no one company can do an adequate job for an entire nation. Even if it were politically possible to replace a government entity by a private company the lack of a multiplicity of companies making a united broad effort would inhibit results.

Rather, the answer lies in the international approach. Oil by its very homogenous character is an international commodity. Its development requires an international approach, with results constantly re-evaluated in the light of the experience of others. It is, in a sense, an international fraternity where mutual good is derived from association with others.



The 6,400-hp tug "Mared" towing a tanker through the Suez Canal

Widening operations at Suez

The future of Suez

by Mahmoud Younes
Chairman, Suez Canal Authority

Under Arab administration, the Suez Canal has continued to handle vessels efficiently and established new records in the number of ships passing through in a single day. Tankers with a draft of 37 feet began moving through this month

In APRIL 1958, I informed the readers of WORLD PETROLEUM about the Suez Canal and the excellent results obtained by the new national Arab administration.* These results were an obvious refutation to the pessimistic predictions of those who tried, in 1956, to cast doubt upon the ability of the Arabs to handle properly the Canal.

Today, just a few years after, the achievements of the Suez Canal Authority confirm the efficiency of the Arabs and the care taken by the responsible people in the United Arab Republic to keep this vital waterway abreast with scientific progress to meet world requirements still better; and contributing, by efficiency and serenity of services rendered, to world peace and harmony among nations.

The following is a brief but eloquent summary of the progress attained:

(1) Execution of the first stage of the Nasser Program.

(2) Improvement of Port Said harbor.

(3) Creation of a pilotage system in Suez Roads.

(4) Construction of a shipyard at Port Fuad.

(5) Purchase of new floating equipment.

(6) Creation of a research center at Ismailia.

Canal Improvements (First Stage of the Nasser Program). Since that time when the present Arab authority was entrusted with administration of the Suez Canal, it has proceeded to keep abreast with the increase in the number and size of transiting vessels and to keep pace with world progress in science.

With the recent completion of the first stage of the Nasser Program, the west cross-sectional area of the canal has increased from 1,250 sq meters to 1,850 sq meters over two-thirds of the Canal's length. Efforts are now made to extend widening to have a uniform cross-section all over the Canal which will allow thus the transit of vessels of more than 35 ft draft.

According to the Canal's schedule: Vessels drawing 35 ft 6 in. will be admitted as from January 15, 1961; vessels drawing 36 ft will be admitted from February 15, 1961; vessels drawing 36 ft 6 in. will be admitted as from the end of March, 1961; vessels drawing 37 ft will be admitted as from the end of April, 1961.

The completion of the Kabret by-pass, dredged through the Bitter Lakes, has also increased the capacity of the Canal to receive a greater flow of transiting vessels.

Improvement of Port Said Harbor. In order to better serve world shipping and tanker traffic and to let Port Said Harbor cope with the intense activity passing through it, the Authority has implemented a wide program including four main points and costing about 4 million Egyptian pounds. These points are:

(1) Construction of 1,600 meters of deep quaysides, thus allowing the berthing of 10 big vessels at a time (no such quays exist now).

(2) Construction of a deep quayside for the loading of salt at Port Fuad. Fully mechanical, it will allow the loading of 200,000 tons of salt per year.

(3) Removal of the islands now existing in the harbor to allow vessels to pass in both directions and widening the harbor entrance channel.

(4) Creation of new islands in Port Fuad in lieu of those removed.

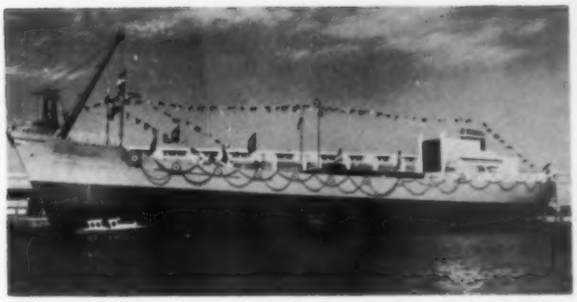
Pilotage Scheme in Suez Bay. On the 20th of June 1959, law No. 161 of 1959 was issued establishing the pilotage scheme in the Suez Bay. It stipulates compulsory pilotage for ships in the Bay after one year of its promulgation.

Consequently, in the early morning of Monday the 20th of June, 1960 the Roads Pilots of the Suez Canal were piloting the ships in the Suez Bay for the first time since the Suez Canal was cut.

Undoubtedly the pilotage of ships in Suez Bay will avoid the risk of accidents in this area. The Suez Canal Authority manages the pilotage in the Bay on behalf of the Ports and Lights Administration.

Port Fuad Shipyard. Acting under the wise direction of President Gamal Abdel

*"The Future of Suez," by Mahmoud Younes, WORLD PETROLEUM, April, 1958, pp. 48-50.



Right: All-Arab 3,200-ton cargo vessel built in the Suez Canal Authority's shipyard

Above: The Dredger "Kasser" at work in the canal

Top right: Floating crane "Emlak," recently purchased by the Suez Canal Authority

Nasser, the Suez Canal Authority began in the middle of March, 1960, the construction of the first seagoing vessel to be built in the Middle East, as a contribution to the industrial renaissance of the country. The launching of this first Arab vessel of 3,200 tons by the President of the UAR took place on the 23rd of December 1960. The characteristics of this vessel are:

Full decktype with a quarter deck. Length, about 78.7 meters; breadth moulded, 12.50 m; draft loaded, about 6.20 m; speed, about 11.50 knots; cargo hold, about 138,000 cbf; main diesel engine, about 1,470 hp; classification, Germanischer Lloyd.

New Floating Equipment. New main units acquired by the Suez Canal Authority are the following:

The floating crane "Emlak" is one of the strongest floating cranes in the world, having a fixed lifting capacity of 200 tons at a height of 35 m and a distance of 8.8 m. The maximum distance at which it may lift is 26 m, at which the lifting capacity is 30 tons. The crane is fitted with two propellers of the most up-to-date type made by Voich Schneider, having 350 hp each and allowing any maneuvering and giving a speed of 5 marine miles per hour. It has two engines, the total installed power of each being 450 hp, and an auxiliary engine of 170 hp.

The Arab dredger "Kasser", built by the IHC Holland Shipyard for the Suez Canal Authority according to a design supplied by the Authority, to operate in rocky areas. Cost was 300,000 Egyptian pounds.

Dredger Kasser was designed to carry out alone both breaking and the dredging operations. She is fitted with a rock breaker and a five-tooth spoon which is dipped into the hard bottom where it exerts a pressure of 70 tons, cutting each two minutes 60 cu ft which are lifted and deposited in barges to be transported far from the navigable channel. One of the advantages of this dredger is that she may be used for dredging points close to the harbor quay sides where other dredgers may not be used.

Towing Equipment—Two salvage tugs, the strongest now afloat, have been acquired by the Authority. They were built in Holland and are of the same type and strength, each one having 6,400 hp and giving a bollard pull of 69 tons.

They can stop instantly in 25 seconds when going at full speed ahead and within a distance of 12 meters. Each tug is fitted with one fire extinguishing pump of 200 tons strength, discharging 200 cubic meters of water at a height of 120 meters and with two pumps of 100 tons strength each discharging 100 cubic meters of water at a height of 120 meters.

These tugs are designed to supply quick efficient help to vessels in difficulty while transiting the Canal. The modern trend in shipbuilding is toward larger vessels, and this increase in size requires stronger salvage means whenever needed. This towing equipment is also available for towing operations outside the Canal and the territorial waters, and such operations between Europe and the Arab Ports have already started.

New Floating Dock: The Authority has decided to purchase a floating dock of 25,000 tons lifting capacity. It will be stationed at Port Said, and tankers of 50,000 tons will be able to enter it. Its specifications are: length, 230 m; beam, 48 m. It will start servicing the transiting vessels about the end of July. It will thus allow big tankers to find repair facilities without being obliged to call at far distant ports.

Research Center at Ismailia: To cope with experiments and research necessary for development of the Canal, the Authority has created at Ismailia a fully equipped Research Center comprising: a laboratory for hydraulics; a laboratory for soil mechanics; a laboratory for testing materials; a basin 100 m long and 10 m wide for the Canal tests; and a basin for harbor tests. This center occupies an area of 40,000 sq m, of which 7,000 sq m are for the buildings.

In all its activities and achievements as briefly reviewed hereabove, the Suez Canal Authority has always aimed at one goal; to contribute, through the Canal, to world prosperity and peace. END

Meet the Author

Emile Bustani, now in his early fifties, was born in the village of Dibbiyeh, Lebanon and received his early education in an orphanage. He later won a scholarship to the American University of Beirut, where he obtained the degree of B.A. with Honors in 1929 and that of M.A. in Astro Physics in 1932. He then entered the Massachusetts Institute of Technology and graduated as B. Sc. Engineering in 1933.

Today he is a member of the Lebanese Parliament and chairman of the largest industrial enterprise in the Middle East—The Contracting and Trading Co. (CAT). While firmly attached to the cause of Arab nationalism, he believes that Arab-Western friendship and cooperation are possible and essential in the modern world, and has expounded this view in his book, *Doubts and Dynamite*, printed in 1958, and in a forthcoming book, *March Arabesque*, to be published by Robert Hale in London this spring and later in the United States.

Emile Bustani is married, with one daughter and two grandchildren (one boy and one girl).

A blueprint for the Middle East

by Emile Bustani

Rising standards of living and economic development are the primary aims of most Arab countries. The oil producing nations would share with the non-producers under this development plan financed by 5% of total oil revenues

THE ARAB WORLD is marked by a great fissure between the oil-producing states, where many people (though by no means all the people) are grotesquely rich, and the non-oil producing states, which lack adequate financial means for internal development.

As long as this inequitable division of riches persists, there is unlikely to be any kind of settled peace in the Arab sphere. Until the non-oil-producing states are allowed to benefit proportionately from the wealth accruing from Arab oil, there can be no settled progress in the Arab world. And Arab unity, even though inevitable, will remain far distant. The well-being of the Arabs tomorrow depends almost entirely upon some sensible reallocation of oil wealth today.

Is there any practicable and cut-and-dried scheme which would enable the "have-not" states of the Arab world—or, at any rate, those among them which act as transit countries for oil supplies—to benefit adequately from oil wealth without disrupting the present 50-50 profit-sharing arrangements between the producing states and the oil companies or otherwise conflicting with existing business relations?

I believe that there is. I myself worked out such a scheme some time ago, and I am delighted to say that it has now been accepted as an objective of national policy by the Lebanese government, which is giving it official backing. It was discussed in considerable detail at the First Arab Petroleum Conference held in Cairo in April, 1959, at which I was privileged to lead the Lebanese delegation, and, at a later meeting of the oil committee of the Arab League in Jedda. At the conference of the League's Economic Council in Cairo in March, 1960, it was acclaimed in principle by everybody present save the Saudi Arabian delegate.

My own proposal is simple enough in essence. It is that 5% of the annual profits from oil in the Arab world should be invested, before distribution and payment of taxes, as savings gaining 2½% interest, in a special oil revenue account opened by the new Arab Financial Institute. These deposits would be made, by mutual agreement, for a specified number of years.

At current rates, 5% of oil profits would represent a sum of about £50 million or $140 million a year. From this capital, Arab countries would be free to borrow for approved development projects, at a low rate of interest not exceeding 2½%, plus a small surcharge to cover the expenses involved by the Financial Institute in handling the loans.

All Arab States, including the oil-producing countries, wishing to avail themselves of this advantage would form a National Development Corp., in which the government would own at least 50% of the shares. The balance would remain open to private subscription by nationals of the country concerned. There would be only one Development Corp. in each Arab country, and it alone would have the right to negotiate loans from the Financial Institute's oil revenue account.

All requests for loans would be accompanied by detailed blueprints of the development projects for which they were required. The Institute would follow normal banking procedure in deciding whether or not to accede to them.

This scheme, if implemented, would have several ancillary benefits in addition to the principal one of giving Arabs everywhere a chance to make their countries better places to live in than they are today. It would remove the jealousy of the "have" States evinced by the "have-not" nations. It would give the producing countries and the oil companies absolute confidence that their oil would continue to flow through the transit countries without hindrance. When nations are active shareholders in the same business it is obviously in their own interests to further operations by all means possible, and no transit country in its senses would seek to impede the source of its own development. It would ensure the creation of Development Corporations in all Arab countries benefiting from it—in itself a healthy and hopeful metamorphosis. Finally, the Western oil companies would assume a new character in the eyes of the Arab people. They would cease to be seen as blood-sucking agents of imperialism, engaged in exploiting human beings rather

Caterpillar tractor moves a 60-ton spheroid across Arabia's soft sands on 32 giant wheels. This off-road transportation by Arabian American Oil Co. took place between the town of Abqaiq and the separator plant at Ain Dar, 65 miles away

A Bedouin tribesman, one of the people of Kuwait. Photograph by Adolf Morath

Terminal pumphouse manifold at Aramco's marine terminal at Ras Tanura, Saudi Arabia

than oil, and be recognized as the basic producers of Arab prosperity.

It may be claimed that the non-producing States have no right to a share of the profits from oil, for the very good reason that they do not produce it. But the Arabs, though they form many nations, are of one nationality. In prosperous Kuwait and poverty-stricken Jordan alike, the people are Arabs. The Arab world is made up of a number of different countries: its population, reason how you will, is made up of Arabs.

If oil were struck in abundant quantities in three provinces of a single country, would anyone think it equitable for them to wax fat on the proceeds without contributing to the national exchequer? Why, then—if it is agreed that the separate Arab countries are no more than great "provinces" in one Arab homeland, as they are both historically and geographically—should not all Arabs benefit from the proceeds of Arab oil?

While there would undoubtedly be a concerted rush for funds in the early days of the scheme's operation, it must be remembered that development work takes time. Neither Rome nor the Aswan High Dam was built in a day. If Egypt had all the money in the world, she could hardly spend more on the Dam's construction than is being spent on it at present, for the very good reason that such projects cannot be hurried in their execution.

Nevertheless, there are a hundred phases of development upon which the Arab countries could embark today, no matter how long it took to complete them. Altogether apart from such major construction works as dams, roadways and harbors, they could begin to develop tourism on a really wide scale, they could open up shuttered Yemen to the outside world, and they could exploit the vast mineral wealth of the Sudan —to mention but three projects which have frequently been discussed but never implemented.

The fact must be faced that the Middle East is no longer a "sphere of Western influence". It is not a sphere of anybody's influence. Nor can the West impose its will upon the Arab States any longer, by means short of violence. But, although France for long attempted to "pacify" Algeria by violent means, it is unthinkable that Britain would perpetrate a second Suez.

Only friendship can provide commercial as well as political dividends. It can prove to be a much more profitable investment than past "gunboat diplomacy" ever did. On a purely practical level, the Western oil companies would benefit from the spread of prosperity throughout the Arab world, if only because oil itself is one of the immediate needs of prosperous people. The more oil that is used, the better for the oil companies. And the more prosperous the Arab world becomes, the more profitable market it can offer to Western suppliers. END

An Arab crew unrolls wire for seismic work in the Sahara. Location is at Hassi Keskes, where a French company, CPA, is exploring.

Members of a seismic crew in the French Sahara examine a seismic record near the instrument truck (CPA photo).

Rebels and oil in Algeria

An independent Algeria will mean review of existing concession contracts in the French Sahara. Leaders of the Algerian nationalists in New York express their willingness to go along with existing international practice in the field of oil concessions. They are accumulating oil experience and have several representatives studying the oil industry in the United States and other countries.

Arabs are getting a rapid education in oil field work and now compose the majority of the working force in the Sahara. This photograph shows a Libyan rig and an Arab worker (Caltex photo).

THE BITTER STRIFE in Algeria and the remainder of French North Africa is drawing to a close in Algeria and the OCRS (the Common Organization for the Sahara). What will be the status of oil and gas concessions already granted in this area if and when the rebel—now known as the provisional government—comes to power?

Interviews with the provisional (rebel) government leaders in New York (where a full-time office is maintained) indicate that the Rebel attitude toward oil is less violent than their general politics. They have adopted a wait-and-see attitude. It seems they can be negotiated with, and that the hundreds of millions of dollars the French and some American companies have poured into the country may not be in vain. From the French view this may be quite an acceptable situation—the government will still retain a Franc Zone source of crude, controlled by French companies.

One of the recent declarations that softened the Rebel attitude was the interview

accorded the Paris newspaper, Le Monde, on February 11th, 1961, by M. Olivier Guichard, the General Delegate to the OCRS. This interview was a written question-and-answer type, obviously carefully prepared and released with the French government's approval. As such it attracted considerable attention. Especially important to the Algerians was the statement that the OCRS is primarily an economic grouping, not political. This would indicate that Algerian independence would include political control over the OCRS area within Algeria, and the provisional government points out as proof of this the fact that the recent referendum on Algerian independence included the southern "Departments" of Saoura and Oasis as well as the rest of Algeria proper. In response to a question concerning the basic legal regime which would affect this area for oil, the reply by M. Guichard stated that the OCRS was in effect a grouping of all states within the French community which touch the Sahara, including Niger, and Tchad as well as parts of Mauritania and the Sudan. In the first two countries conventions already exist making them subject to the OCRS Petroleum Code and its amending regulations. Negotiations are already underway through M. Faure. Joint General Delegate for the OCRS, in Mauritania and the Sudan. Tunisia and Morocco are also said to have expressed interest.

In response to another question concerning a possible new legal regulation for oil, the responses indicated that since about 450 billion old francs (about US $1.3 billion) had been invested already, this investment should serve the economic and social development of the Sahara and its adjoining regions. Going on to say that some 8.6 million tons of oil had been extracted in 1960, and some 17 million tons (350,000 b/d) would be produced in 1961, the statement adding that these figures were approximately as previously estimated but the geographical distribution of production had changed slightly due to the lower production obtained at El Gassi but that at El Agreb had made up the difference. Ohanet was cited as a particularly important discovery as well. Estimate for 1965 production was 30 million tons (about 600,000 b/d).

The Rebels have not been idle, to judge by the statements of their New York office. While believing that French views on subsoil ownership in the Sahara coincide reasonably well with their own, they point out that the Rebel government is not bound by the concessions granted by the French but will consider them carefully and will cooperate with the OCRS so long as it does not interfere with the provisional rights of ownership. Algerian leaders feel confident they can better negotiate with Libya for a common understanding agreement on oilfields which may cross the Algerian-Libyan border than can the French. They point out that the same is true of Tunisia, and that they have received aid from both countries in the past. Mali has already manifested its willingness to cooperate, they say.

The same leaders dodge questions on whether they consider the traditional 50-50 profits split a just basis for company operation in oil. They point out that they are not behind the times, however. That they have a committee on petroleum was in operation which attends the principal oil meetings and congresses, etc. Some of the personnel on this committee work in the oil industry within different countries, keep notes on techniques and exchange information. There is one such representative in Indonesia, the remainder are in the Middle East and Africa, according to the Rebels' New York office. There is no representative in Venezuela at present, they state, but the report by the Venezuelan delegate to the recent Arab Petroleum Congress at Beirut (October 1960) caught Algerian attention. They claim the French are behind the times and slow to develop new techniques in their African operation as compared with the Americans in Venezuela and Saudi Arabia. Five young Arabs are reportedly in the United States studying aspects of the oil industry. Two are to receive their Master of Science degrees in June of 1961.

As an example of their oil attitude, the Algerian representatives point out that they have never touched the oil installations themselves, only the oil pipeline which crosses Algeria on its way to the Mediterranean. They point to some 20,000 Arabs employed in the Sahara, and claim they have enough sympathizers there to wreck the oil industry if they should so desire.

That they have not done so yet is due to the belief that the OCRS is economically motivated, not politically. They remarked several times recently on the fact that in the recent referendum concerning Algerian independence, all 15 Algerian "Departments" voted, including the two Saharan departments of Saoura and Oasis, as well as those along the coast. "Why should we sabotage oil?" the Algerians' New York representative asked, "It will eventually come over to us and in the meantime think what it is costing the French to guard their installations. It takes two regiments to guard the pipeline alone, plus helicopters and auxiliary equipment."

Gas has attracted Algerian attention as much or more than oil. They feel that with the huge quantities discovered in the Sahara will be of use to local industry and especially to agriculture for pumping water, possibly for creation of electrical power as well.

In reply to a question concerning the Algerian provisional government's attitude toward international private investment, it was replied that they welcome such international investment—its form to be worked out in a way that will be based on international practice. Algerial participation and employment in new industries is stated as a primary aim. Representatives of the oil industry in New York point out that they had definitely better be on the liberal side as regards the final form of concession agreements and ease of reaching a modus vivendi for international capital. Recent developments in Algeria's oil industry have been very disappointing. It looks like the production oil territory is concentrated along the eastern border where the CREPS fields of Edjeleh and Zarzaitine are located. Hassi Messaoud field is growing more expensive and unpredictable as production goes forward, and exploration to the west has been unproductive. END

Desert operations require complete facilities. Shown here is a Saharan camp belonging to CPA, a French company, at In-Azzene. At left is the messhall in the background, with the drilling rig. Other buildings are quarters for crew.

Algerian crew on the rig floor for CPA in the French Sahara near In-Azzene.

Isolated drilling rigs in Libya must be supplied by air, despite the cost of such transport. Shown is an Oasis Oil Co. rig at Well B-4 receiving its regular flight. Photograph is by Clarence Keller for The Ohio Oil Co.

PROBLEMS IN LIBYA

The first applications for surrendered areas in Libya have been accepted, but a period of negotiations must ensue before grants are made. Red tape, meanwhile, has ensnarled the industry and halted progress, with a controversy over import duties filling the warehouses with unused equipment. Construction of a major pipeline from Esso's Zelten discovery is going forward, however, and a line from the Oasis find is planned.

The road to drilling sites often leads through country reminiscent of the far western states of the United States. Here a truck bent on oil finding makes its way past eroded cliffs similar to those of Utah or Wyoming (Caltex photo).

LIBYA'S OIL INDUSTRY has been a state of suspense as surrenders of acreage were made through 1961 but no grants of the surrendered areas were made. Without warning the jam broke as of March 8 and those companies that were all prepared filed immediately. Those companies were Phillips, Panam (Pan American International) and Cori, and the areas applied for are indicated on the accompanying list. This list shows the released areas as combined or split up by the Commission into areas for which applications may be made. The ground rules, according to the Commission, are that an application may cover only one of these areas, but for all of each area and not a portion thereof.

The opening up of the areas came as somewhat of a surprise since it was the general belief that applications would not be entertained for another month or two. Apparently the decision was taken rather suddenly because the Commission staff was not fully prepared to accept applications. For instance, the list was not put out until March 8th, although the combinations were indicated on the Commission's map in their offices. Phillips made one application for 26A, which was accepted, but they later had to break it up into two applications.

Phillips applications run from 162-165, Cori 166-167 and Panam 168-172. There will probably be extended negotiations for additional benefits from the new applicants.

At present, activities in Libya are held up by a controversy over customs duties. The government published a list of duty-free imports early in 1961 which was very limited. It did not include such vital items (not obtainable in Libya) as drilling mud, for example, or explosives for seisinic work. The companies protested vigorously, since the oil law grants them the explicit right to import materials and equipment needed for operations without duty. The government admits in private conversations that it needs money and this seemed the easiest place to get it. The companies do not see things in the same light, however, and equipment is stacking up on the docks while the companies fight to get it through.

Aside from these red-tape difficulties, Libya's rank as a first-rate oil exporting nation seems assured, even though no new discoveries have been made in the first two months in 1961. There is serious doubt that North Africa is another Middle East—but Libya will average over 1,000,000 b/d by the end of 1965, using the most conservative figures. As of the beginning of February 1961, productive capacity had reached 126,655 b/d (none of which was yet being produced pending completion of pipelines to the Mediterranean) from 72 oil producers. The best of these potential oil producers is still Esso's 17,000 b/d Zelten well, but there are other excellent wells too. The future is not all rosy, however. Discoveries have been concentrated in a small area of the Sirte Basin, and it is beginning to look like the Paleozoic area may not be prolific. The situation is the same elsewhere in North Africa, with Algeria also looking less promising as time goes on. Discoveries continue to be concentrated along the eastern edge, around the area of the CREPS finds. These discoveries by CREPS, incidentally, do not extend into Libya. There is a definite geological break about at the border.

About 19 companies are presently involved in the search, including every major oil company and a greater number of independents. Nationalities represented include 12 companies from the United States, one from Britain, one Anglo-Dutch (Shell Group company), two German, two Italian and one French. There are a number of other companies waiting warily on the side-

RELEASED AREA'S FOR APPLICATIONS FOR CONCESSIONS

(Appendix to circular letter 201)

	Zone	Area Sq. Km.
1B	4	2,883
1C	4	1,683
26A (north)	4	6,578
Phillips (162) Cori (166)		
Splitline between 26A (north) and 26A (south along 30° lat.		
26A (south)	4	6,419
Phillips (163) Cori (167)		
50A	4	4,943
78A	1	5,953
23A	1	1,388
23B	1	2,388
38A + 34C	1	6,241
42A	1	3,257
8A	1	2,994
39A + 43B	1	3,158
43A + 30A	1	4,435
40A + 3A + 30B	1	4,028
17A + 44A	1	2,911
25A	1	2,145
Phillips (164) Panam (168)		
24A	1	1,205
24 + 11A (north) + 16A	1	3,379
Splitline between 11A (north) and 11A (south) along 30°35' lat.		
32A + 11A (south) + 32B	1	2,299
11B	1	1,568
Phillips (165) Panam (169)		
20A + 47A	2	2,253
Panam (170)		
13A	2	1,791
6B Panam (171)	2	1,700
41B + 6A (west)	2	5,392
Splitline between 6A (west) and 6A (east) + along 20°10' long.		
6A (east) + 12A Panam (172)		
41A	2	1,090
18A	2	941
18B	2	867
46A	2	871
46B	2	2,201
46C + 31A	2	3,337
36A	2	1,447
2A (north) + 19A	2	3,778
Splitline between 2A (north) and 2A (south) along 31°35' lat.		
2A (south) + 37A (west) + 14A + 37B	2	3,883
Splitline between 2A (south) and 2A (east) and between 37A (west) and 37A (east) along 23°40' long.		
37A (east) + 31B + 2A (east)	2	6,341
33A	2	1,850

Drilling crew composed of Libyans performs on a rig floor (Photo courtesy of The Ohio Oil Co.).

About two billion barrels of oil have been found in Libya. Here is one of the better finds, Oasis Oil Co.'s Well A-2 in Concession 59, testing at about 4,400 b/d.

lines as well. They include Phillips Oil, Canadian Delhi, Sinclair, Midwest Oil and Texas Pacific Coal & Oil, Libyan Texas (which reportedly includes Clark Refining and some Dallas interests), a group composed of D. D. Feldman-Crown Central-Kewanee, Superior Oil, Cities Service/Richfield; Kerr McGee (agents also for Felmont, Champlin and Cabot Carbon); and Pure Oil, acting as agent for Tidewater, Union, Sun, Skelly and Ashland Refining. There are a number of other companies that put in an appearance occasionally and, as local circles say, "they are not in town to see the Roman ruins."

Few of the newcomers hold concessions yet, but most are holding reconnaissance permits which can be renewed yearly and permit geophysical work (except seismic) to be done outside the borders of their concessions for information on surrendered areas and better geological understanding of their concession areas.

These companies had poured the not-unsubstantial sum of US $369,600,000 into Libya by the middle of 1960, which amounts to a small Marshall Plan in itself. Some 9,150 persons were employed in oil as of that same date, of which 6,300 were Libyans. A total of 213 wells had been drilled at the end of February, 1961 in extremely difficult territory and they were extremely expensive. Cumulative seismic work to the mid 1960 point was 624 party months, with 1,414 months of geological work. This type of work is not cheap either; a seismic party costs about 2,800 dollars per day, and a drilling rig costs about 7,000. All materials are trucked in, but personnel and perishable foods are carried in by charter airplane, a drilling rig requiring two trips of a DC-3 per week.

All this activity is taking place in an area which a few years ago was considered geologically unpromising. Cambrian and Ordovician sandstones and quartzites cover most of Libya. The western part of the country is divided into two distinct basin: the Gadames (on the northwest) and Mourzouk (southwest), both containing primarily Paleozoic sediments.

The country is divided geologically by a north-south Silurian trend from Tibesti through Gargaf to Garian. East of this trend some early Paleozoic sediments are present, particularly in the Kufra Basin. Eastern Libya's main area of interest is the Cretaceous-Paleocene basin near the Gulf of Sirte.

Most important find to date is the Zelten field by Esso. Now on about its 23rd well, this field has been fairly well delimited and all drilling is on inside locations. The wells drilled so far have varied widely, as might be expected in a large field. One was dry and all the rest have been smaller producers than the original 17,000 b/d discovery, but the field appears to be in the billion barrel class.

Esso is building a 30-inch pipeline to transport the crude to the Mediterranean, which will start at Zelten and have its terminal at Marsa El Brega. Arabian Bechtel is the contractor. Total length will be about 100 miles. Construction of this line began in January 1961, it will cost about US $16 million. This includes $5.1 million for the pipe. The line will be buried along its entire length. It will not need pumping stations originally, the combination of gravity flow, large-diameter pipe and location of the tank farm at Marsa el Brega will enable delivery of the field's full production without pumping to tankers offshore. Harbor facilities will include dredging, a breakwater, an underwater crude delivery line for offshore tanker loading, and similar items. The harbor and all facilities will be completed by the first half of 1962.

At the terminal, four 268,000 barrel crude-oil storage tanks are being built, plus five tanks ranging in size from 5,000 to 24,000 barrels to serve as a bulk plant for products to supply operators in the Sirte basin area pending construction of a refinery by Esso Sirte. Later they will form part of the tank farm of the refinery which Esso Sirte will build to supply Esso Standard (Near East's) Libyan market requirements.

Esso's latest well has been Reguba, drilled on a farmout from Libyan American. Esso Sirte is the drilling company. The first step-out from Reguba was 19 kilometers north. It was dry, and quite low. To the east, Esso found a good well but it bottomed in tight quartzide which is slowing up production rates. A well was drilling in mid-March in line between the first and third wells but slightly to the southwest. It, too, may be low. Pay was found in the first well at 5,281 ft, and this well was at 5,600 ft with no pay reported at the mid-month period. There is still no evidence of structure in this discovery area. It is so broken up that seismic interpretation is difficult and Esso is not yet sure it has a field in this discovery.

Reserves in Libya: While estimates of Libyan reserves are hazy at this time, there exist enough discoveries to hazard a guess. As of the beginning of 1961, proved recoverable reserves are estimated at around two billion barrels for all of Libya. This is an impressive figure if compared with countries such as Canada which have taken almost three times as long to develop similar reserves.

Reserves in the Oasis find are estimated in the 500 to 640 million barrel class. This is estimating some 100 square miles of productive area at about 20,000 barrels per acre-foot. The discovery at Dahra may develop 400 million more barrels. Esso's find at Zelten will produce eventually some 800 million to 1.2 billion barrels, which would put reserves for the entire country in the area of two billion barrels plus. This estimate includes Libyan American finds, which are some 200 million barrels, but not the recent discovery by Esso Sirte on Libam's acreage under joint operation. END

The "Thumper" in action. A three-ton weight had just been dropped a distance of nine feet, inducing a seismic wave comparable to a blast of 2½ lb of 60% gelatine dynamite

The Geograph recording truck. An FM magnetic tape recorder inside the vehicle stores seismic data from weight drops made by the Thumper

Weight dropping in North Africa

by Alan D. Waldie*

SINCE 1951, when Mr. Burton Mc Collum of Houston first demonstrated his seismic invention of weight dropping, the system's flexibility, versatility, and results obtained have captured the imagination of the geophysical industry. Over seven years have passed from the time the first commercial "Geograph" weight dropping crew began operation in Edwards and Sutton counties of West Texas, and, today, there are more than two dozen such crews operating in the United States, Algeria, Tunisia, Libya, and Spanish Sahara.

With each new well, with each new discovery, the North African countries of Algeria, Tunisia, and Libya are proving their value to be "New Frontiers," potentially rich in petroleum deposits as a future additional supply of oil for the world's demands. Consequently, exploratory efforts are continuing at a fast pace throughout these, and other parts of North and South Africa, to more fully define these rich deposits which are now known to exist.

As of January 1st, 1961, a total of 36 seismic exploration crews were operating throughout Libya—in concessions now held by 17 oil companies; concessions which barely five years ago held no more promise of wealth than that which could be gleaned from their barren surface by the nomadic native tribes of Arabs who roamed through them from one oasis to the next.

The month of March, 1956, marked the beginning of a new industry in Libya. For it was in that month that the geophysical industry made its start with a gravity survey in Esso's concession 6. In June of that same year, the first seismograph shot was fired in Mobil's Libyan concession 9. And, in October 1958, a Geograph weight dropping crew began its Libyan operation for Oasis Oil in concession 26.

Today, nine weight dropping crews are performing for six oil companies in Libya to prove their seismic value without the need for explosives, drills, water trucks, and other equipment associated with the seismic operations of more conventional shooting crews. For, with weight dropping, a large mass is dropped from a truck which transports the weight from one drop position to the next, creating the necessary seismic shock wave from the ground impact of the falling weight.

The "Thumper" (see photo) drops a 6000 lb weight from a height of nine feet, inducing into the earth a seismic wave comparable to a blast of about 2½ pounds of 60% gelatine dynamite. As each of these drops is made, a special FM, magnetic tape recorder sequentially records the resulting seismic reflections from detector stations, dispersed over the area of survey, and stores this information on magnetic tape. These tapes are processed on a Geograph Universal Analyzer (a form of Analog computer) to yield a seismogram which is interpreted in a manner similar to conventional shooting seismic records.

The Thumper has habitually been put to work at first in areas of extremely poor to NR (No-Record) conventional seismic record quality. The quality of records obtained by the Thumper in these areas has been highly gratifying as is evident by the rapid increase in the number of crews working. (This might have been expected since the Thumper had previously proven itself beyond doubt in the difficult Delaware Basin of West Texas for the past five years).

When placed in areas where seismic record quality obtained by use of drills and dynamite was fair to excellent, the Thumper has consistently been able to get better results at a lower cost per kilometer.

A fair sampling of production figures can be obtained by a study of the statistics covering operations of five Thumper crews in Libya during 1960 for a total of 54 crew months. These five crews averaged 4.6 kilometers subsurface coverage per working day during 1960, or 125.3 kilometers per month. The production ranged from a high of 11.5 km/day during one month in an area of excellent record quality, to a low of about 1.5 km/day in a previous NR area

(*Continued on page 80*)

A "jug hustler," a Libyan Arab carries a string of geophones.

*Mr. Waldie is chief engineer, Robert H. Ray Company, Inc., at Sharia Bu Mingel, Tripoli, Libya.

MAJOR CATASTROPHES, as shown vividly by this scene from a refinery fire, can be avoided. This is one of the primary targets of the new API Operating Practices Committee

STOP DISASTER! — major goal of newest API committee

by J. C. Ducommun
American Oil Co.*

New Operating Practices Committee dedicated to greater process safety in plant operations and reduction of all types of operations hazards

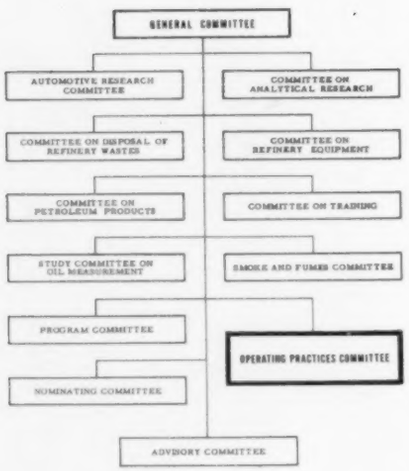


Fig. 1—How the new committee fits into organization of the API Division of Refining

A NEW ORGANIZATION dedicated to the prevention of refinery processing accidents has become a regular part of the Division of Refining of the American Petroleum Institute. Called the Operating Practices Committee, it came into being in January, 1960, after nearly two years of planning and development.

The need for a forum in which refining executives and operating supervisors could interchange process-safety knowledge and experiences has probably existed since the earliest days of the industry. But it was the increasing frequency of detonations (a particularly violent type of explosion) in the last several years that spurred the industry to action at this time. What before had been merely desirable was recognized, in light of these evidences of greatly increased hazard, as an absolute necessity.

While it will give its main attention to efforts to prevent major accidents, the new committee will also study means of preventing upsets of a less serious nature, and the general improvement of refinery operations.

The Operating Practices Committee, including its subcommittees, currently has a membership of about 80, who represent 50 oil companies and engineering contractors. With two meetings now behind it, the committee has completed its organizational work and has begun its technical program.

Development and Formation: The objectives and principles of a process safety program developed by American Oil (at that time Indiana Standard) provided a guide for formation of this new API committee. And that company program, in turn, was reorganized and greatly intensified after two devastating detonations at American's

*Mr. Ducommun, vice president, manufacturing, American Oil Co., Chicago, Ill., is chairman of the new API Operating Practices Committee.

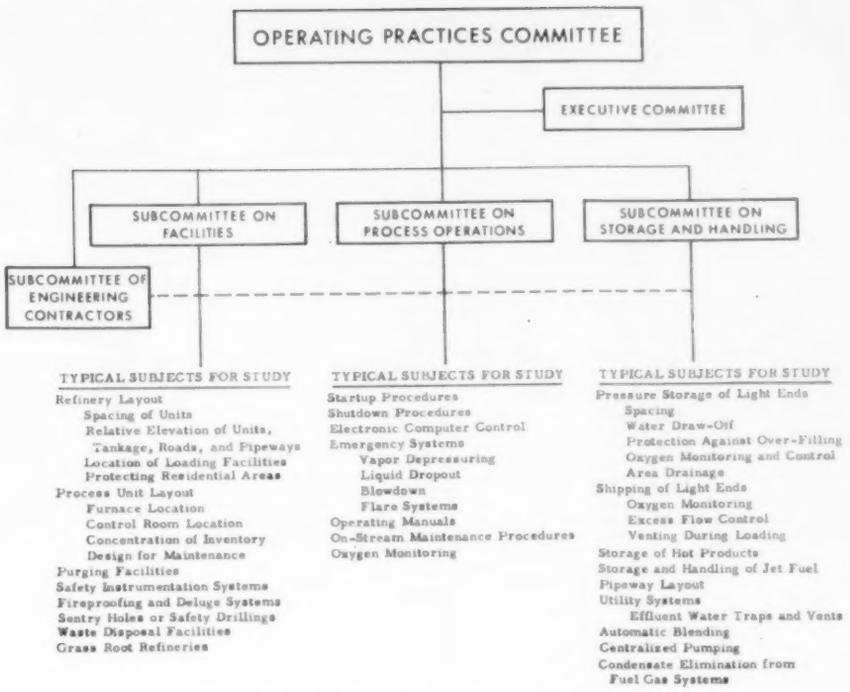


Fig. 2—Organization of the Operating Practices Committee

Whiting refinery, one in 1955, the other in 1957.

As we studied cause and effect in those two detonations, we naturally searched the industrial literature for possible parallels elsewhere. We found, contrary to our initial impression, that detonations had occurred before and that other types of serious refinery accidents had occurred again and again. Each accident brought corrective action at and near the scene, but almost never did it bring such action throughout the industry or even throughout a single company. Moreover, little effort was being devoted to making sure that the lessons learned from each accident were carefully documented and then taught to the new people entering the industry.

In short, the principles long and successfully applied in refinery personnel-safety programs were being neglected and even ignored in the equally vital field of refinery process safety.

American Oil's program and now the API program are designed to correct these deficiencies.

At the 1958 mid-year meeting of the Division of Refining, I proposed that the API consider development of a program to focus industry attention on the whole subject of process safety. Then to demonstrate the form such a program might take, we of American Oil conducted two forums at the annual meeting that same year.

Open to the public, these two sessions—on the hazards of water and of air, respectively, in refinery operations—were planned to insure maximum audience participation. Our company's safety booklets on these two subjects were distributed, and the Ethyl Corp.'s movie "Danger! Water!" was premiered at the first session, in November.

Encouraged by the success of these two forums, Shell, Esso, Texaco, and American cooperated in presenting at the 1959 mid-year meeting a session devoted to discussions of safe operating procedures and protective facilities.

Before these demonstration sessions some API members had expressed a fear that open discussion of dangers in refinery operations would bring an adverse public reaction. The sessions themselves ended all such fears. Representatives of government agencies and of the insurance carriers have applauded the API for the straightforward, self-propelled approach to this large safety problem.

On the basis of the demonstrations, the General Committee of the Division of Refining approved the report of a study group that recommended formation of the Operating Practices Committee. Fig. 1 shows how the OPC, as subsequently organized independent of other committees in the division, fits into the API structure.

Objectives: This committee's foremost objective is to provide a means of alerting the widest possible segment of the refining industry, from the smallest refiner to the largest, to the history, causes, and cures of operational hazards. It serves, consequently, as a forum to which can be brought reports of operating accidents or near accidents for discussion on a round-table basis.

We do not intend to try formulating uniform solutions to the problems thus spotlighted; that would be a hopeless task. Rather, we hope to promote a growing understanding of process-safety principles through a sharing of information about successful corrective action. Long-range, the work of the committee is intended to assist refiners in developing improved operating-safety programs tailored to their own particular needs.

A secondary objective of the committee is to provide for the direct participation of operating management in API activities. Hitherto, a cautious consideration for proprietary interests and possible legal involvement has tended to inhibit such participation. Usually refinery operating management confined its activities in the API to mere attendance at the organization's regular sessions with virtually no participation in the committee work. In the special field of process safety, however, the interchange of experience and ideas will not interfere with proprietary rights at all.

The OPC's program is intended to reach people in a wide variety of positions in the industry. Management, engineers, and operating supervisors alike can benefit from the committee's work because process safety must be considered in all stages of planning, design, construction, and operation.

Membership: Because the influence of men with broad backgrounds in the actual operation of units was believed necessary to effective committee work, refiners were encouraged to name to the OPC top echelon men from their operating or engineering departments. The response to this suggestion was gratifying, with the result that the committee now has a membership well qualified to handle its broad-gauge assignment.

We recognized, too, that engineering contractors have a considerable influence on process safety in new facilities. From the outset, then, plans for the committee included provision for getting the advice and assistance of this group. The Subcommittee of Engineering Contractors now has a membership of 19.

OPC is interested in bringing together the widest possible range of experience. Companies not now participating are being actively encouraged to join.

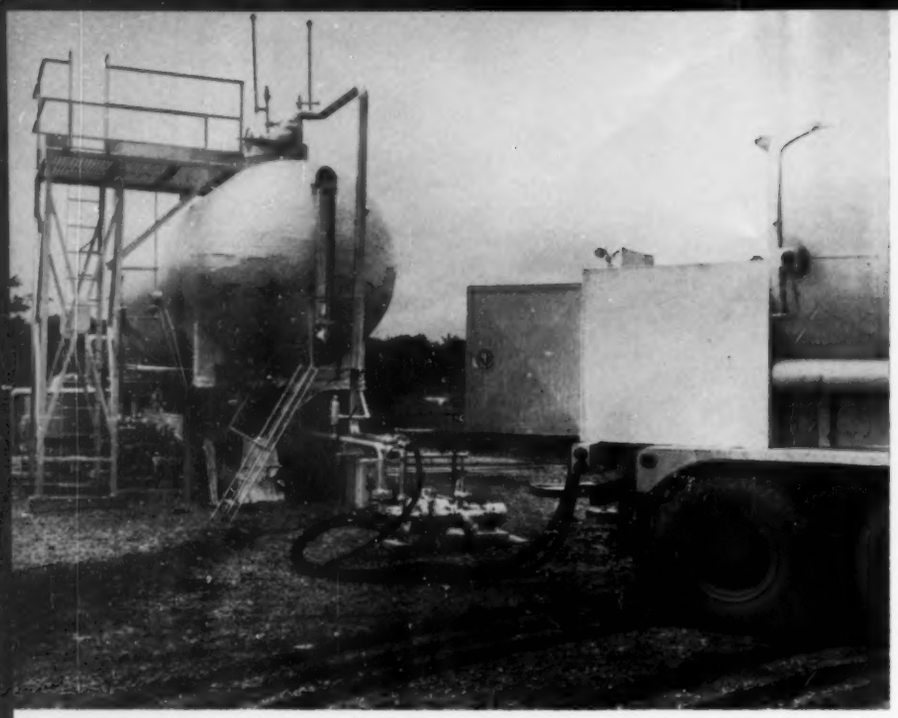
Organization: With a valuable assist from the Division of Refining staff, we developed an organizational plan that has helped the new committee get off to a quick start.

Since it was obvious that the committee as a whole would be too unwieldy to permit effective focus on specifics, three subcommittees were organized (Fig. 2). Each of these works in a separate area of process safety and reports regularly to the full committee. Subcommittee assignments are, in general, these:

(1) The Subcommittee on Facilities, with E. W. Griscom of Sinclair Refining Co. as chairman, concerns itself with safety aspects of the planning, design, and construction of new refinery facilities. The group's assignment covers considerations of process-unit layout and over-all refinery layout.

(2) The Subcommittee on Process Opera-

(Continued on page 78)



Above: Field unit used to test injectivity improvement

Left: Delivering CO_2 by tank truck to field storage tank

Injectivity increases result from flood water carbonation

Application of the Orco process in Oklahoma water flood has increased injection rate per psi 200 to 400%, speeding production of secondary oil and increasing net recovery

"Orcoflood" in Osage Planned

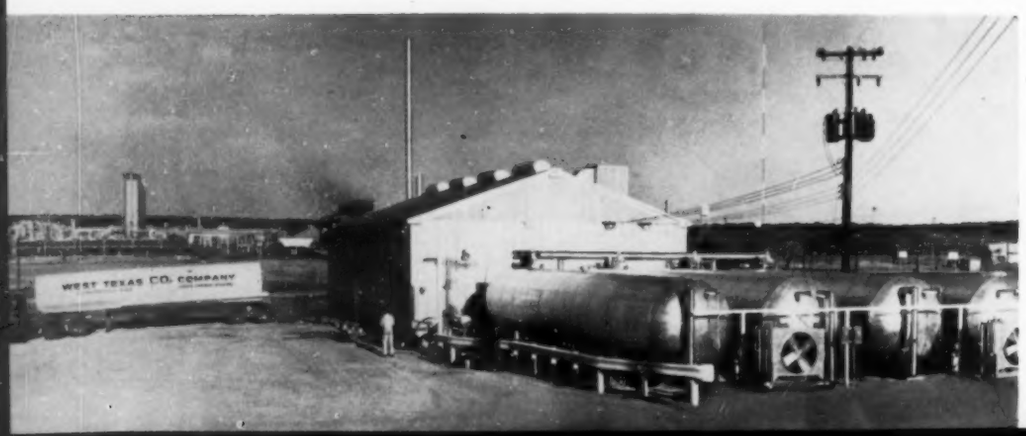
Cities Service Petroleum Co. has obtained approval from the Osage Tribal Council to undertake a carbonated water flood on 2,000 acres in the Domes field, 12 miles west of Bartlesville, Okla. The 10-20 ft Bartlesville sand pay found at 1,800 ft is expected to produce 6 million bbl of secondary oil as a result of application of the Orco process licensed by Oil Recovery Corp. Injection of CO_2 will begin in May.

APPLICATION OF THE "ORCO" carbonated water injection process to a secondary recovery project in West Texas recently has been undertaken by Helmerich and Payne, Inc., American Petrofina Co. of Texas, and Oil Recovery Corp., owner of the process.

The property involved is the 1,170-acre White and Baker field of Pecos County with 55 wells producing an average of 3 b/d. It is the first project of its kind in Texas and was undertaken after earlier commercial ones in Oklahoma proved the value of the process.

First commerical Orco flood which proved the feasibility of the process was in the Bartlesville sand area north of Dewey, Okla., on a 240-acre block of three leases. This flood, known as the K&S project, was begun in 1958 and since has been extended to surrounding leases. All leases in the area have responded well to the carbonation.

A feature of the Orco process is the very large increases in water injectivity which result after CO_2 and small quantities of



Carbon dioxide liquefaction plant and storage of West Texas CO_2 Co. with transport truck used for deliveries to White & Baker field

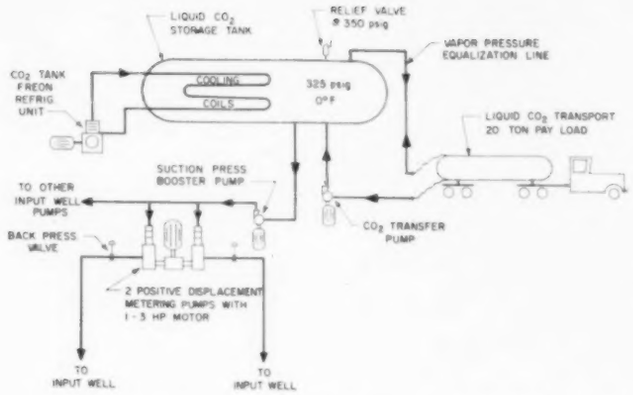

LIQUID CO_2 STORAGE TANK
RELIEF VALVE @ 350 psig
VAPOR PRESSURE EQUALIZATION LINE
CO_2 TANK FREON REFRIG UNIT
COOLING COILS
325 psig 0°F
LIQUID CO_2 TRANSPORT 20 TON PAY LOAD
SUCTION PRESS BOOSTER PUMP
TO OTHER INPUT WELL PUMPS
CO_2 TRANSFER PUMP
BACK PRESS VALVE
2 POSITIVE DISPLACEMENT METERING PUMPS WITH 1-3 HP MOTOR
TO INPUT WELL
TO INPUT WELL

Fig. 1—Schematic of liquid CO_2 storage and pumping

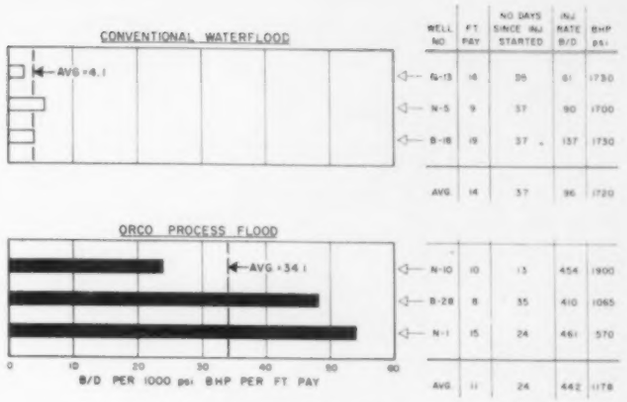

CONVENTIONAL WATERFLOOD
AVG = 4.1
WELL NO.
FT. PAY
NO. DAYS SINCE INJ. STARTED
INJ. RATE B/D
BHP psi
G-13 16 36 61 1730
N-5 9 57 90 1700
B-18 19 37 137 1730
AVG 14 57 96 1720
ORCO PROCESS FLOOD
AVG = 34.1
N-10 10 13 454 1900
B-28 8 35 410 1065
N-1 15 24 461 570
AVG 11 24 442 1178
0 10 20 30 40 50 60
B/D PER 1000 psi BHP PER FT PAY

Fig. 2—Injectivity test, White & Baker field, Pecos City, Texas

other adjuvants are introduced into injection wells. It was this feature which was a prime factor in determining operators of the White and Baker field to adopt carbonation since conventional water flooding techniques had not been successful.

The Queen sand was discovered in the White and Baker field in 1935, and by 1947 primary production had proceeded to the point where repressuring was undertaken to maintain output.

For a period of 6½ years between August 1947 and January 1954, gas was injected into four wells. A total of 1.2 billion cubic feet was injected before excessive gas breakthrough caused abandonment of repressuring. Subsequently a pilot water flood was begun and in the three years ended on July 1, 1960, an average of 100 b/d of water was injected into each of the six wells. The pilot flood produced 154,000 bbl of oil of which 29,500 bbl was credited to the flooding technique. As of last July, two leases being flooded were producing 150 b/d of oil and 100 b/d of water from 32 operating wells.

It has not been possible to step up the injection rate by increasing pressure on the intake wells because the sand breaks down at about 1,250 psi.

Before making application to the Texas Railroad Commission for permission to employ the Orco process, a number of field tests were undertaken to determine the effect of carbonation on injectivity at pressures which are feasible. For this purpose a small portable CO_2 storage tank with suitable injection pumps was brought in. Carbon dioxide was purchased commercially and brought in by tank wagon from Fort Worth.

The field test unit built up an injection rate of 400 to 600 b/d, from four to six times the plain water injection rate. Increases of as much as 890% in injectivity were obtained.

On the basis of the field tests Orco engineers have estimated that it will be possible to produce an additional 6,025,000 bbl of oil before abandonment of which 1,946,000 bbl will be derived solely from the application of the Orco process. The field originally contained an estimated 16,000,000 bbl of oil. Production prior to June 1, 1960 totaled 2,953,000 bbl, at which time oil saturation was 47% of pore space. The flood is thus expected to produce twice as much secondary oil. At final abandonment, residual oil saturation of swift portions of the field is expected to be down to 15—20%.

Average depth of the sand in the White and Baker field is 7,750 ft which is adequate for the injection pressures which the Orco process employs for effective operation.

Estimated average pay thickness in the field is 15 ft, average porosity 21% and horizontal permeability 50 mds.

Carbonation of the field is to be accomplished by stages. The first stage which got underway in November began with 16 injection wells and nine producing wells in nine 20-acre five-spots.

Present plans of the operators are to inject CO_2 for a year into first stage wells after which stages two and three will be begun at one year intervals. After carbonation is completed normal flood water will be injected for an additional six years. In that period it is calculated that the entire six million barrels of economically recoverable oil will have been produced.

Carbon dioxide for the White and Baker project is being purchased from the West Texas CO_2 Co. of Fort Stockton, Texas. This company, jointly owned by Oil Recovery Corp. and Helmerich & Payne, Inc., was formed to sell carbon dioxide to any user located within economical transportation distance of its plant. The CO_2 liquefaction plant is located alongside the Northern Natural Gas Co.'s hydrocarbon gas purification plant in the Puckett Ellenberger gas field. This gas contains about 28% carbon dioxide and hence is not merchantable without separation. About 40 mmcf of carbon dioxide gas previously was being vented daily. The initial carbon dioxide liquefaction capacity of the $500,000 plant is about 3 mmcf/d daily.

Liquid carbon dioxide from the plant is being transported to the White and Baker lease in two refrigerated tank trucks. Each truck can haul 20 tons per load. This is an increase of five tons over earlier trucks not equipped with high tensile steel.

First field test of the Orco process was conducted eleven years ago on a lease of Bradley Production Co. in Alleghany County, N. Y., which had been producing naturally and by flooding for a half century. In this experiment dry ice was hauled to the lease and vaporized for injection. When the flood began the lease was producing 0.25 b/d per acre. The CO_2 flood brought output up to 4.2 at the peak and after 17 months output still was six times as great as when the test began. Output during the period was 1,200 bbl per acre. Following this test a field experiment was conducted in Oklahoma with less success although the process developers learned from it many of the techniques which now are being applied in the K&S, Post Oak and other projects.

K&S was the first commercial project. It was begun in 1958 and now has been in progress nearly three years so that concrete accomplishments have been recorded. The 240-acre property was developed in 1905 and operated as a primary production project until 1934. In that 29-year period output was 438,000 bbl. The property was abandoned until 1951 when the K&S Drilling Co. developed a small dump flood with one injection well and 16 producing wells. Output between 1951 and 1957 totaled 74,000 bbl bringing the cumulative to 512,000 bbl before the property was purchased by Oil Recovery Corp. At that time production was constant at 30 b/d.

Producing horizon is the Bartlesville sand which is found at 1,250 ft and has an average productive thickness of 33 ft. Core oil saturation before flooding averaged 31%. Core examination revealed a laboratory residual oil saturation of 21.4% after conventional flood pot tests and laboratory tests reduced this to 11.4% by CO_2 flooding. Average sand permeability was 56 md and average porosity 17.6%. Connate water saturation was 27%.

Most of the wells on the K&S property had been plugged when the CO_2 flood was begun so that it has been necessary to re-

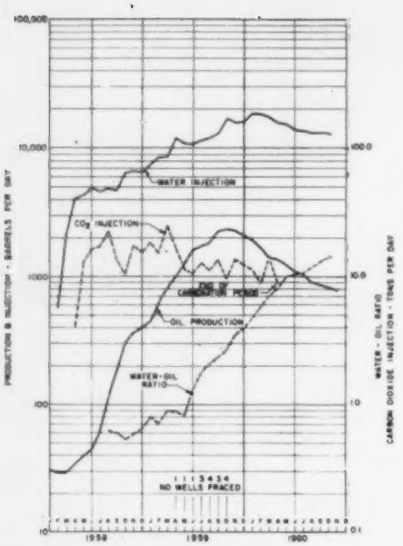


Fig. 3—Production and injection history, K&S project

drill the entire tract. In addition, two water supply wells were sunk to the Arbuckle sand at a depth of 2,500 ft. The two produce 13,000 b/d of salt water which is lifted by Reda pumps and added to recycle water from producing wells.

Producng wells are completed with 7-inch casing set at the top of the sand, cemented and shot. A majority of the wells have been fractured although in latest wells completed the fracturing has been quite light because of water intrusion into earlier wells from vertical fractures extending into a water sand below the oil pay. In most recent wells 7-inch casing has been cemented through the oil pay, perforated with two jets per foot and given a light 1,500-gallon sand-oil frac.

In the input wells, 2½-inch cement-lined tubing is set and cemented at the top of the sand. Water is injected through this tubing and CO_2 through ¾-in. steel pipe at the sand face. Both water and CO_2 are metered to individual wells for accurate control.

Producing wells are completed with 7-set leases, brine injection was begun into eight input wells on February 13, 1958. By May 1 the number had been increased to 23 and by January 1, 1959, line wells were completed and injection begun into the entire project. CO_2 injection begun at the center of the lease on April 1, 1958 and by stages into others. Carbonation of the first injection wells was completed within a year and on all weils in the project by April 1, 1960.

Injectivity of wells increased from as low as 10 bbl per well per day before carbonation to an average of 700 bbls per day per well. Injection pressures have been stepped up but injection per psi is two to four times as great as in adjacent wells which have not been carbonated. Recently injection of water in the 35 input wells on the tract, including line wells has been 18,000 b/d.

Oil production record of the tract is given in an accompanying chart which shows that output rose from 30 b/d in the early months of 1958 before carbonation was begun, to a maximum of more than 2,300 b/d late in 1959. Production now has declined to about 800 b/d. Total production since the project was undertaken to Jan. 1, 1961 is 1,104,000 bbl. Orco engineers now calculate that the total will reach 1,350,000 bbls before the decline curve reaches an uneconomic level in early 1963. Recovery is expected to exceed by 37% an independent consultant's estimate of 986,000 bbl possible by normal water flooding.

Results have been more spectacular on an adjoining lease to the north. This is a 35-acre tract which was producing 15 b/d from four wells before an agreement was reached between its operators and those flooding the K&S tract. Engineers for the north offset tract had calculated that they should recover 120,000 bbl in about 10 years by normal water flooding.

After carbonation crude output rose to a peak of 420 b/d within a year and recently was 270 b/d. Cumulative production now exceeds the 120,000 bbl calculated as the water-flood ultimate by 47,000 bbl and the lease will not be flooded out until 1965 based on extrapolation of the present decline curve. Total CO_2 flood production should exceed the anticipated water flood output by more than 80%. Wells on the north offset benefited from the fact that fracturing was not done.

Oil Recovery Corp. has purchased 240 acres south of the K&S tract and began CO_2 injection in April 1960. Carbonation of the lease which is known as the Post Oak will be complete about the middle of 1961. Production from the tract at the beginning of 1960 was 300 b/d, part of which was attributed to K&S line injection wells. Recently output has risen to 800 b/d and the curve will continue to rise for some time to come.

Carbon dioxide for the K&S and adjacent leases is manufactured on the lease by burning natural gas and extracting the CO_2 by conventional means with monoethanolamine. With carbonation of the K&S tract complete the CO_2 is now being diverted to adjoining leases. The CO_2 plant represents a $400,000 investment which is about eight times the cost of field facilities necessary where CO_2 can be purchased at reasonable delivered cost as in the case in West Texas and most oil producing areas.

Engineers for Oil Recovery Corp. estimate that reduction in time necessary to complete flooding will cause many properties to become profitable which would not show a payout if flooded conventionally.

Originator of the Orco Process is James W. Martin, a chemical engineer now retired, who spent most of his active life in CO_2 engineering work. At one time he was chief engineer of a large dry ice manufacturing company, and thereafter was an independent consulting engineer in the CO_2 industry until he joined Oil Recovery Corp. During his early work, he observed chemical reactions between CO_2 and lubricating oils at certain temperatures and pressures in the compressors evidenced by an aromatic odor in the dry ice and the formation of organic acids in the heat exchangers. These observations caused him to later think of the possibility of using CO_2 in connection with the recovery of oil from underground reservoirs.

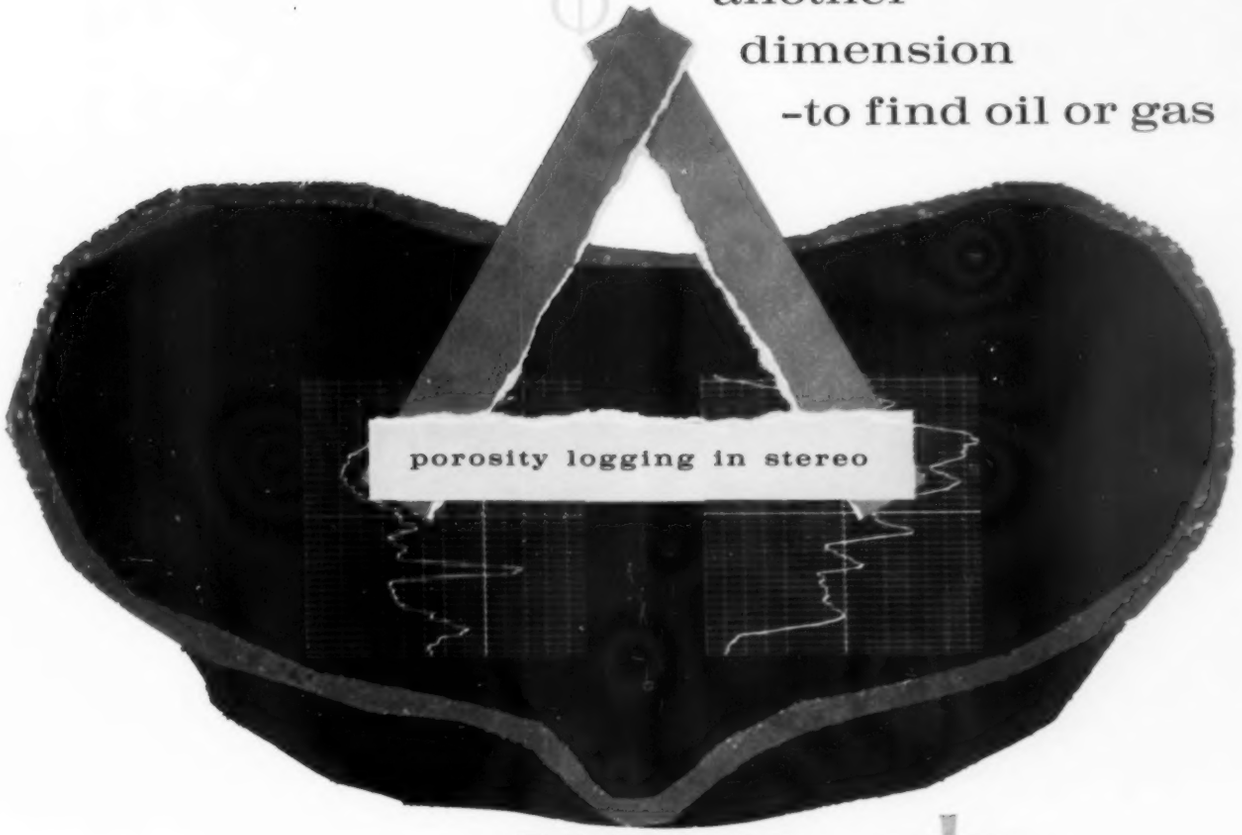
During the 1940's, an increasing interest in the use of surface active agents for improving the secondary recovery of oil was generated in the oil industry. At this time Mr. Martin recalled his earlier observations of the chemical reaction of CO_2 and lubricating oil and visualized the use of carbon dioxide as a cheap raw material which under certain temperatures and pressures would react with the hydrocarbons in the oil reservoir and form the necessary surface active agents *in situ*. This led him to undertake the basic laboratory work, which defined these reactions, and later resulted in the development of the Orco process.

During the subsequent laboratory and field work, several other features of carbonated water injection were observed. He found that carbonated water promotes the solution of salts such as calcium and magnesium carbonates. His work also led him to conclude that certain clays that exist in many oil field formations do not hydrate and swell in the presence of carbonated water as they do in the presence of non-carbonated water. The CO_2 decreases the pH of the injection water by forming carbonic acid and, thus, limits harmful bacterial growth. For example, in the K&S project, there have been instances in which injectivity declined due to bacterial growth after carbonation had been discontinued. When a small further amount of CO_2 was introduced into the well, it was found that the former injection rate was restored.

The Orco process during the early period of a flood utilizes the injection of small quantities of light hydrocarbons such as butane or propane and a surfactant. It is thought that carbonated water and the reaction products have the effect of limiting the adsorption or plating out of surfactants in the sand so that the usefulness of these surfactants may be enhanced by permitting them to be carried along with the front of a flood.

The K&S and other Orcofloods have proved that injection of carbonated water under controlled conditions of volume and pressure have the effect of greatly increasing injectivity with the result that the flooding can be concluded much more rapidly than with a conventional waterflood and that greatly increased recoveries are obtainable. These two features, increased oil recovery and increased water injectivity, tool for the efficient economic recovery of couple together to provide an important secondary oil. END

look at another dimension -to find oil or gas



When two porosity devices disagree on the apparent value of porosity, *the difference is significant.*

Each log responds to a characteristic that is related to porosity; each log also may be affected by other characteristics in a particular manner.

For example, gas affects the Sonic and Neutron Logs in an opposite manner—the difference readily indicates the presence of gas.

The appropriate choice of porosity logs will depend upon formation and hole conditions. The following porosity tools are available from Schlumberger:

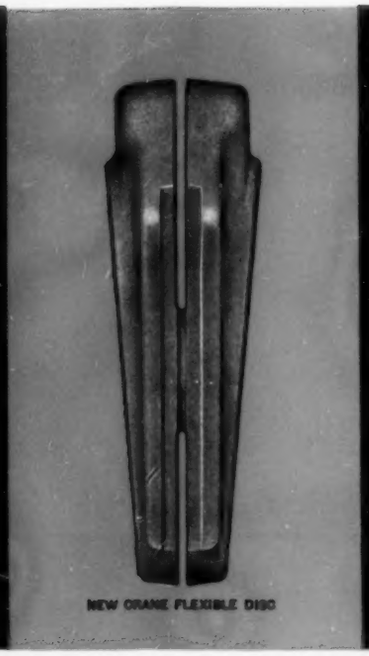
Sonic Log	Microlaterolog
Neutron Log	Microlog

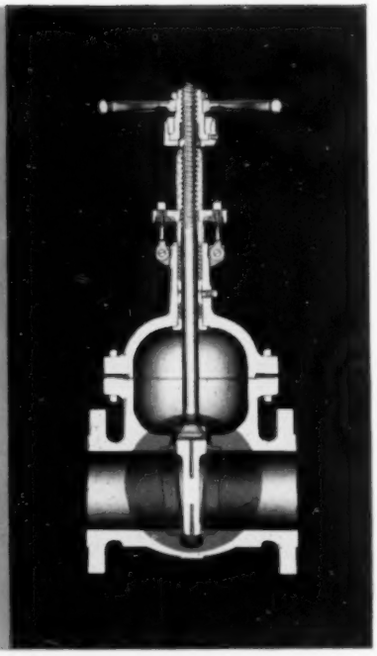
Consult your local Schlumberger engineer to determine the set of porosity logs which will give you an added "oil-finding" dimension.

SCHLUMBERGER

PROOF OF QUALITY

Every Crane product is checked for quality at every step of its production. Crane maintains the industry's most complete facilities for engineering, manufacturing and testing its products.





New CRANE FLEX GATES eliminate sticking in oil operations... operate with less torque . . . outperform any conventional gate valve now in use

Crane Flex Gates are the most significant advance in gate valve design in 25 years! Instead of being made with a solid disc, Flex Gates have separate disc faces that flex slightly when seat faces are joined. This flexibility allows them to conform to the new position and compensates for any minor seat misalignment due to pipeline deflections.

Flex Gates can't stick when closed—even if closed while hot and allowed to cool. They stay tight on both faces over a wide range of pressures. Minimum operating torque is assured for both seating and unseating. Because they're flexible, body seat rings and faces can be serviced economically and quickly.

In some services one Flex Gate does the work of 2 conventional gate valves—saving substantially on piping costs. Extensive field tests show that Crane Flex Gates outperform any conventional solid wedge disc valve now in use.

They are ideally suited for oil, oil vapor, gas, steam or water service. Stem and disc seating faces are Crane Exelloy. Shoulder-type seat rings are Exelloy or Crane No. 49 Nickel Alloy. Where hard facing material for high temperature-pressure service is required, Stellite seat facings can be furnished.

For complete information on this new line of gate valves call your Crane Representative. Crane International makes available to you a complete line of valves from the source most desirable to you—based on price, geographical location and service.

VALVES · ELECTRONIC CONTROLS · PIPING · PLUMBING · HEATING · AIR CONDITIONING

CRANE

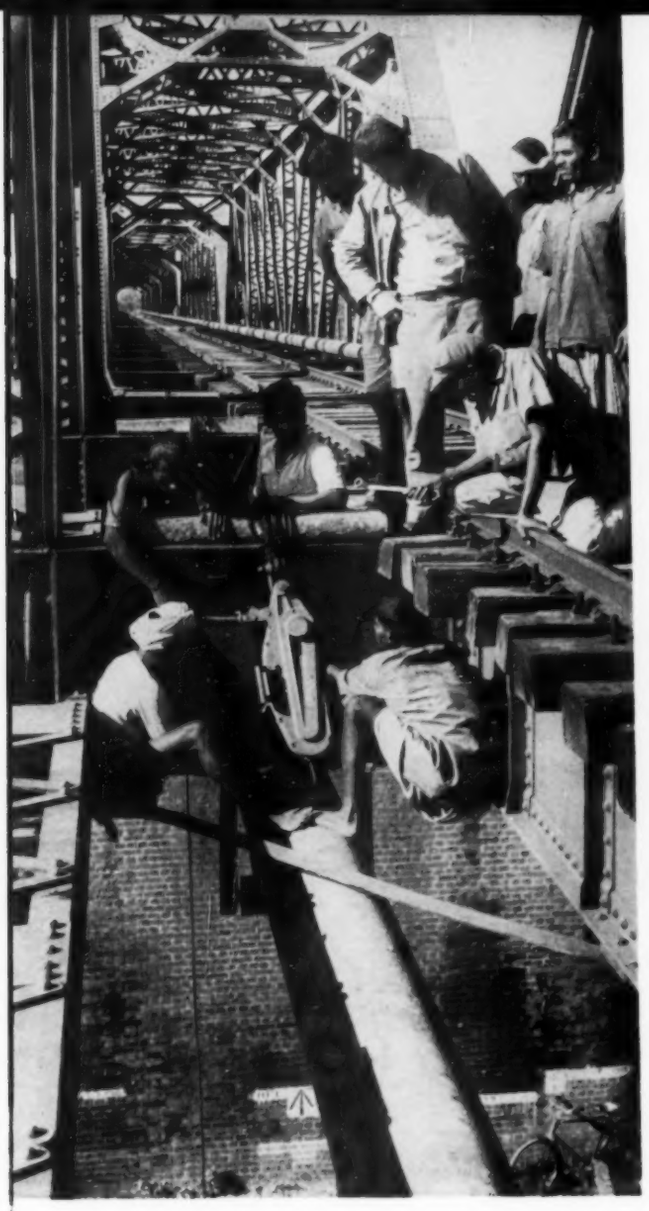
INTERNATIONAL

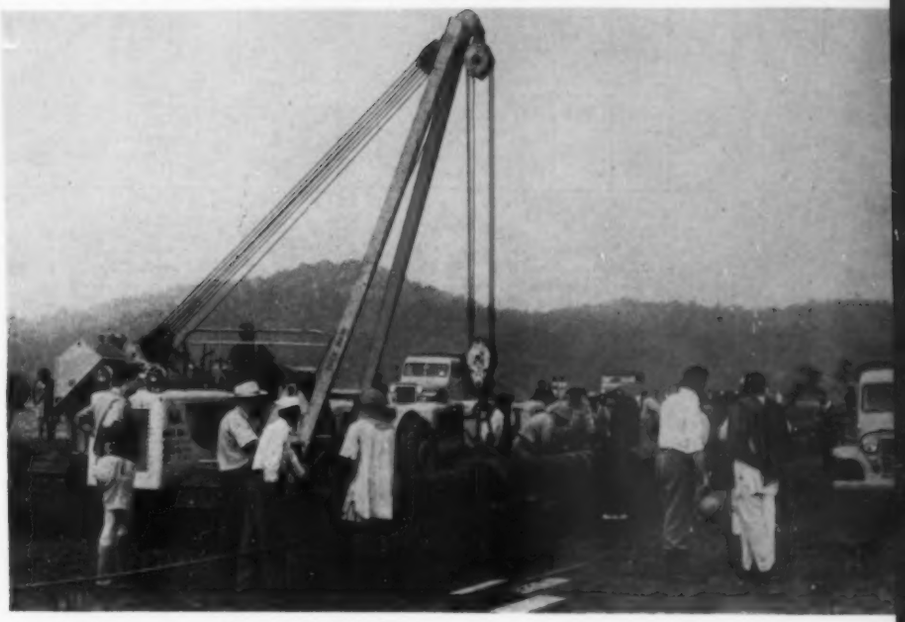
International Headquarters 60 East 42nd Street, New York 17, New York, U S A

MANUFACTURING IN

U.S.A. CANADA ENGLAND FRANCE HOLLAND ITALY

K5





A construction crew near Nunmati, Gauhati, Assam

Stringing pipe across the Burhi Dihing River in Upper Assam to carry crude oil from the Nahorkatiya and Moran fields

Oil India pipeline starts

WITH THREE SPREADS working simultaneously in three different districts of Assam, India has embarked on construction of the largest oil pipe line system in the country. The 720 mile line will connect the Upper Assam oilfields of Oil India Private Ltd. which is a joint venture between the government of India and The Burmah Oil Co. Ltd., with the two government refineries at Nunmati, Assam state and Barauni, Bihar state.

The pipe line will be constructed in two stages—the first of 270 miles as far as Nunmati being scheduled for completion by November 1961, and the second of 450 miles to Barauni in Bihar in the second half of 1962.

As far as Nunmati the line will have a diameter of 16 in. and from Nunmati to Barauni a diameter of 14 in. The line was originally intended to convey 2.75 million ton/yr of crude oil from Nahorkatiya to Nunmati and 2 million ton/yr from Nunmati to Barauni. It has, however, been designed so as to make possible, as and when required, an economic expansion of throughput of four million ton/yr. The construction agency appointed by Oil India is The Burmah Oil Co. (Pipe Lines) Ltd. and the main construction contractors are Messrs. Mannesmann and Saipem.

The 16-in. pipe for the first stage, imported from the UK, was manufactured by Messrs. Stewarts and Lloyds. The 14-in. pipe for the second stage is being supplied by Hindustan Steel at Rourkela.

Throughout its length the line will cross 78 rivers, including the Brahmaputra. Pumping stations will be erected at intervals of approximately 90 miles. Repeater stations will also be installed along the line to maintain radio communications throughout its length. The radio system will carry signals which will indicate to pipe line headquarters at Gauhati conditions at every pumping station and also permit operation of pumping stations by remote control. In the event of an emergency, the whole pumping system can be shut down from the central headquarters control, or individual valves can be closed to isolate particular sections.

Difficult conditions of weather and terrain together with serious logistical problems in areas where communication facilities are limited make the whole project a serious challenge to those responsible. END

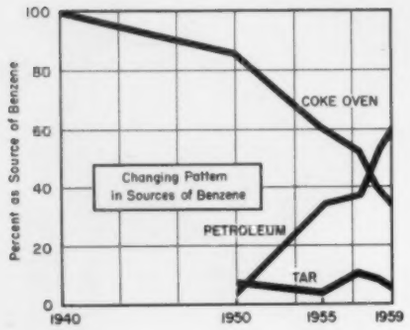


Table 1—Benzene Production Pattern
(1959 production—347,118,000 gal; a 17% increase over 1958)

Year	1,000 gal	Coke oven	Tar	Petroleum
1940	138,000	100%	—	—
1950	174,000	87%	7%	6%
1955	283,000	61%	4%	35%
1957	331,548	52%	11%	37%
1958	287,170	41%	9%	50%
1959	347,118	34%	6%	60%

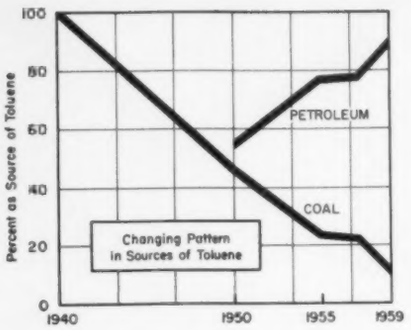


Table 2—Toluene Production Pattern
(1959 production—281,614,000 gal; a 17% increase over 1958)

Year	1,000 gal	Coal	Petroleum
1940	30,000	100%	—
1950	84,000	46%	54%
1955	185,000	23%	77%
1957	197,559	22%	78%
1958	239,595	14%	86%
1959	281,614	11%	89%

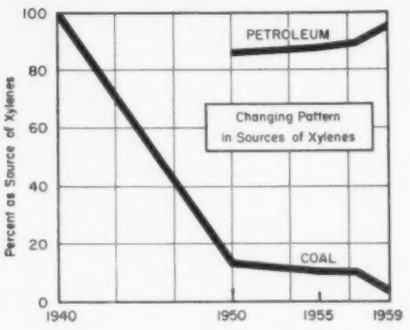


Table 3—Xylene Production Pattern
(1959 production—241,467,000 gal; a 20% increase over 1958)

Year	1,000 gal	Coal	Petroleum
1940	5,600	100%	—
1950	71,900	13%	87%
1955	107,900	11%	89%
1957	127,208	10%	90%
1958	200,498	5%	95%
1959	241,467	4%	96%

Recent trends in aromatic chemicals from petroleum

by Dr. Ralph Landau

About the Author

Ralph Landau received his Sc.D. in Chemical Engineering at Massachusetts Innstitute of Technology, after receiving his B.S. at the University of Pennsylvania. He spent several years as a process and development engineer with M. W. Kellogg Co. and as head of the chemical department of Kellex. Dr. Landau has been executive vice president of Scientific Design Co. Inc. since its founding in 1946.

Dr. Landau is the author of many papers in the fields of chemistry, chemical engineering and engineering management, and holds many patents. He is a member of AIChE, ACS, Electrochemical Soc., AAAS, Faraday Soc., Sigma Xi, Pi Mu Epsilon, Tau Beta Pi (Fellow), and a fellow of the New York Academy of Sciences. He is a licensed professional engineer in New York, New Jersey, and Delaware.

PETROLEUM HAS EMERGED as the dominant source for aromatic chemicals,* as demonstrated in the three charts above and in the data in Tables 1, 2, and 3. It has now exceeded all other raw materials as a source for benzene and has been ahead of other sources for toluene and xylenes since 1950. And, although naphthalene has been produced entirely from coal tar, there are now facilities under construction which will greatly reduce the percentage of total production coming from coal tar.

These changes in aromatic raw material sources were all brought about through necessity, and will have far reaching effects on the industry: (1) petroleum refiners now have an important entry into petrochemicals through control of the raw material supply, and will be able to utilize and upgrade various byproduct streams; and (2) the abundance and low cost of these materials will encourage even more the development of new derivatives and new processing techniques.

With all the new developments, only a very small amount of the hydrocarbons available from petroleum or natural gas are now utilized in petrochemical manufacture. In 1959 it was estimated that petrochemical consumption from natural gas and oil accounted for less than 4% of the total USA output of these hydrocarbons.

The enormous potential availability of aromatic hydrocarbons can be pictured when it is considered that at an assumed USA crude production rate of 3 billion bbl/yr, about 3.5 billion lb/yr of benzene, 25 billion lb/yr of toluene, and 30 billion lb/yr of C_8 aromatic hydrocarbons are available through catalytic reforming and catalytic cracking. Even greater quantities could be produced by various processes under the proper economic incentives.

Production-from-petroleum figures for 1959 are about 1.5 billion lb for benzene, 1.8 billion lb for toluene, and 1.7 billion lb for C_8 aromatics.

Benzene has gone through a critical supply situation as demand increased sharply for styrene monomer, synthetic phenol, nylon, dodecyl benzene and maleic anhydride—all of the principal derivatives. Total benzene production is expected to reach 510 million gal (almost 3.75 billion lb) by the end of 1960, up from the 347 million gal (2.54 billion lb) for 1959. However, while petroleum-derived benzene ac-

*Aromatic chemicals are considered to be benzene and compounds related structurally to benzene; such as toluene, xylene, naphthalene, indene, methyl-naphthalene, diphenyl, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, chrysene, etc., and their derivatives. At present, however, only benzene, toluene, xylene, and naphthalene and their derivatives are of commercial importance, and only these aromatics are considered in this article.

NOTE: Based on a paper presented before the Petro-Chemical Symposium, American Institute of Chemical Engineers, Tulsa, Oklahoma—September 27, 1960.

PIPE AND TUBING FOR THE PETROLEUM INDUSTRY

Falck is one of the leading manufacturers in Italy of quality carbon and alloy steels.

Its products are manufactured under the most rigid quality controls and to the most exacting specifications.

Tubular products for the petroleum industry are manufactured to all API and ASTM specifications including the highest grades.

SEAMLESS LINE PIPE in sizes up to 8.5/8", in all grades and thicknesses.

SUBMERGED ARC WELDED LINE PIPE, in sizes from 16" up to 32".

CARBON AND ALLOY STEEL PIPE FOR REFINERY SERVICE, according to ASTM specifications.

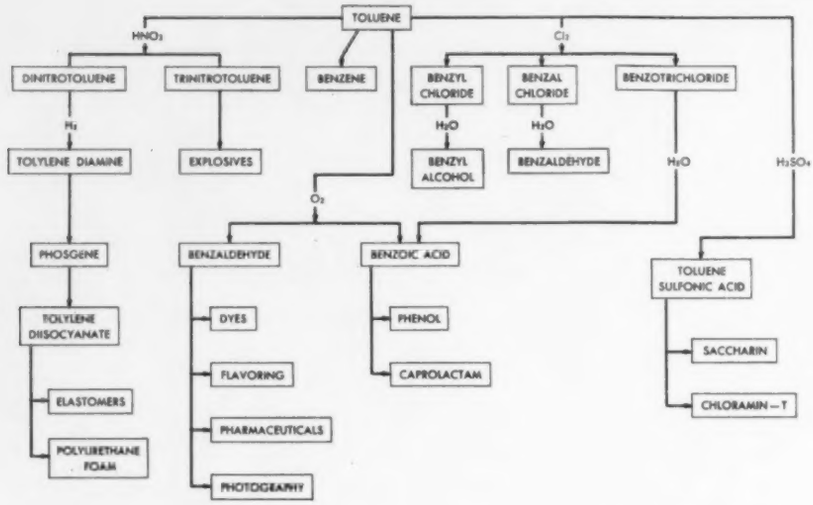
API-CASING-TUBING AND DRILL PIPE, in sizes up to 7" and in all grades.

ACCIAIERIE E FERRIERE LOMBARDE FALCK

INDUSTRIA METALLURGICA MECCANICA ELETTRICA

MILANO - Corso G. Matteotti, 6 - ITALIA

FIGURE 1—TOLUENE DERIVATIVES



counted for just over 50% of the total benzene in 1958, petroleum benzene in 1959 was over 60% of the total. (See Table 1 and the charts.)

Present petroleum-derived benzene capacity is estimated at 300-320 million gal/yr, and new facilities announced will boost USA capacity by about 200 million gal in a year or so. Benzene production from petroleum increased 48.5% from 1958 to 1959, and could increase over 50% from 1959 to 1960.

Because of greater demand for benzene derivatives outside the USA, and because less reforming capacity is required due to relatively lower gasoline octane levels, benzene is also in short supply in Latin America, Mexico, and almost all of Europe. This situation is reflected in price fluctuations, and it is reasonable to assume that any excess benzene capacity in the USA will find its way into exports with little difficulty. Imports into the United States are primarily from Poland and Russia, and these can be cut off at any time as Russian production demands wipe out their benzene surplus.

In this regard, as indeed for other aromatic raw materials, the availability of export opportunities will be seized upon by American oil companies. The current dollar shortage in America (who would have believed this possible ten years ago?) can certainly be alleviated by taking even greater advantage of such special American situations.

Toluene, although available in large quantities and good purity, has had a remarkably small chemical utilization, aside from TNT production (Fig. 1). It is readily available from petroleum, and production from this source amounted to 1.50 billion lb in 1958, 1.81 billion lb in 1959, and is expected to exceed 2 billion lb in 1960 (Table 2). At this time, use of toluene in aviation gasoline is diminishing as jet fuel demand rises, and in motor gasoline as compact cars return to regular gas.

The largest non-fuel use for toluene is as a solvent in lacquers for wood and automotive finishes. Other chemical uses include diisocyanates, vinyltoluene, benzyl chloride, toluene sulfonates, benzoic acid and its derivatives, and various nitrated and halogenated toluenes.

Xylene. Tremendous quantities of the xylenes are produced, along with benzene and toluene, from the catalytic reforming of naphthenes or paraffinic hydrocarbons. The amounts of xylenes formed depend upon the crude being charged and the reforming processes used. The average content of the mixed xylene stream is 40 to 50% meta-xylene, 20 to 25% ortho-xylene, 18 to 23% para-xylene, 10 to 12% ethyl benzene.

Xylenes are the predominant fraction of the aromatic hydrocarbons in petroleum, unlike coal tar products which are predominant in benzene. While some 1.75 billion lb of xylene were produced in 1959 (Table 3), this was nowhere near the potential that could be made available of 30 billion lb of xylenes. Few chemical uses as yet exist, (Fig. 2). For 1959, the U.S. Tariff Commission reported production of 61,722,000 lb of ortho-xylene, and 157,966,000 lb of para-xylene.

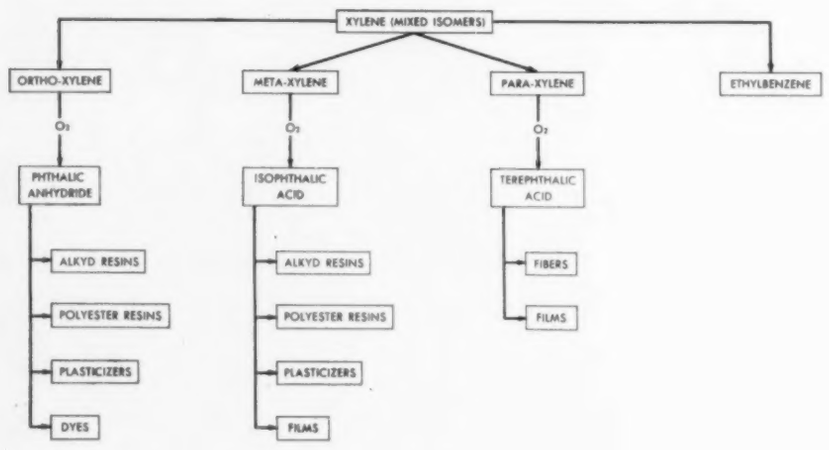
Naphthalene has been the single commercial aromatic raw material produced only from coal tar. Thus, its production has been dictated by the health of the steel industry, and the steel industry has not been in good condition recently. The only major use for naphthalene, but a very important one, is in the production of phthalic anhydride. In 1959, some 425,293,000 lb of naphthalene were produced, all from tar distillers and coke oven operators. At the recent rate of production, the 1960 figures probably reached about 550,000,000 lb.

Increasing demand for phthalic anhydride coupled with decreasing naphthalene supply created serious problems in the industry. To offset future possibilities of naphthalene shortages, several petroleum refiners have announced their intention to produce naphthalene from petroleum. Ashland Oil & Refining Co., Sun Oil, and Collier Carbon & Chemical Corp. with Tidewater Oil, will produce petroleum naphthalene using the catalytic hydrodealkylation of alkyl naphthalenes similar to the Hydeal process developed by Ashland Oil and Universal Oil Products. However, an immediate solution to the shortage is not in sight, as it will be some time before any petro naphthalene is available. By 1962, petro naphthalene capacity could reach 325 million lb/yr.

To add to the problem, imports of naphthalene are decreasing as the phthalic anhydride industry in Europe consumes the available supply. Russia and Poland, formerly large exporters of naphthalene, are no longer making that raw material available, and it must be presumed that they are consuming their output.

Countries such as Italy and Japan have already been forced to forget naphthalene and have turned to ortho-xylene for production of phthalic anhydride. Approximately 75% of the phthalic anhydride produced in these countries is from ortho-xylene, most of it imported from the USA.

FIGURE 2—XYLENE DERIVATIVES



BENZENE

Petroleum benzene is produced directly

from a petroleum reformate by Udex extraction followed by distillation; and can be produced from toluene or xylene in the Hydeal process developed by UOP and Ashland Oil & Refining Co.

In the Udex process, developed by UOP and Dow Chemical, aromatic hydrocarbons are selectively extracted from a hydrocarbon feed by a special solvent such as diethylene glycol in a multistage countercurrent extraction column. The aromatics are stripped from the solvent, and can be distilled in a train of three columns, making pure benzene, toluene and C_8 aromatics.

The Hydeal process, the first commercial units of which are now being built (such as by South Hampton Co., Ashland Oil & Refining, Dow Chemical, Plymouth Oil, Signal Oil, Sunray, and Suntide), will utilize readily available toluene and xylene as sources of benzene. Some large benzene users among chemical companies are also building Hydeal units (e.g. Monsanto).

In practice, reformate streams, light oils and other aromatics found at refineries can be mixed with hydrogen-containing gas, and dealkylated in contact with a solid catalyst. The cooled and separated liquid effluent is stabilized and then distilled to secure nitration grade benzene.

The alkyl aromatics are converted to benzene as follows:

$$C_6H_5CH_3 + H_2 \rightarrow C_6H_6 + CH_4$$

$$C_6H_4(CH_3)_2 + 2H_2 \rightarrow C_6H_6 + 2CH_4$$

Yields of benzene are claimed to be 90 to 95% of theoretical using toluene; 85 to 90% of theoretical from xylene. Since toluene prices are substantially lower than benzene prices, such conversion units to benzene are economically attractive and will also tend to stabilize the price of benzene, at the required reasonable levels. In time, it is possible that benzene prices may trend downward, which will tend to shift Hydeal units for making benzene from toluene to larger sizes. In any event these developments will encourage the development of new benzene derivative plants.

Benzene derived from petroleum is quite pure and sulfur-free. It may thus command a premium price under certain conditions and is more suitable and often necessary for processes dependent on raw material purity.

Several processes are now available to desulfurize benzene, toluene, and other coke oven aromatics that are expected to result in coke oven aromatics that can compete with petroleum aromatics in purity and price.

One such process recently announced (using sodium) is offered by U.S. Industrial Chemicals Co. The process is said to require lower capital investment than that for the hydrogenation process used by large volume producers of aromatics from coke.

BENZENE DERIVATIVES

(1) **Styrene:** Styrene is by far the largest-volume derivative of benzene, accounting for over 40% of all benzene produced. The manufacture of styrene monomer involves two basic steps—the production of ethyl benzene, and the cracking of ethyl benzene to yield styrene. Union Carbide, however, operates another path to styrene from ethyl benzene, involving intermediate manufacture of phenyl methyl carbinol. There are three routes for the production of ethyl benzene—alkylation of benzene with ethylene (usually of high purity); the extraction of ethyl benzene from a mixed C_8 aromatics stream; and the method of contacting gas streams containing low concentrations of olefins with benzene to produce alkylated aromatics such as ethyl benzene.

In the Friedel-Crafts exothermic liquid phase alkylation, ethylene (usually pure, but not necessarily so) is added to benzene using anhydrous aluminum chloride as a catalyst. This is similar to the Friedel-Crafts production of cumene. High yields and low capital investment feature this technique.

The two other methods are newer and will continue to exert an influence on the increasing styrene industry, although the great majority of styrene produced in the world today is by the foregoing Friedel-Crafts reaction. The Alkar process (UOP), which can also be used to produce cumene, is a fixed-bed catalytic system (presumed to be BF_3) that can use low olefin content gas streams and obtain high conversion of olefins to alkyl aromatics. The process can produce ethyl benzene from the pure ethylene streams ordinarily used for chemical conversions, or from more dilute ethylene streams. El Paso Natural Gas, Odessa, Texas, is operating an Alkar-type unit and obtains its ethylene feed stock by the steam cracking of propane, while buying high purity benzene. Cosden Petroleum Corp. will add a commercial Alkar unit to utilize the ethylene recovered from residue gas of a cat cracking unit, and benzene from its own BTX unit (which also makes toluene and xylenes). It already has a plant extracting ethyl benzene from its xylene stream by superfractionation designed by Badger Manufacturing Co.

Another user of this Cosden technique is Sinclair-Koppers Chemical Co. The new joint venture will buy the ethyl benzene content of mixed xylene streams from Sinclair's aromatics extraction unit, and sell its styrene output to Koppers Co. Inc.

The most interesting recent development in styrene manufacture is probably not technical at all but economic; i.e., the very great increase in plant capacity now underway despite the very low price of styrene. Fears of over-capacity have been expressed, but may be premature.

Estimated capacity for styrene monomer plants—those built, under construction, or announced—comes to over 2.1 billion lb/yr by the end of 1961. It is estimated that 1960 capacity has been about 1.6 billion lb. Styrene production in 1959 reached 1.57 billion lb, a 28% increase over 1958 production.

(*Continued on page 60*)

History of the Aromatics Industry

The early organic chemical industry, up until the first World War, was founded primarily on dyestuffs, pharmaceuticals, solvents, and similar products. All raw materials came from the distillation of coal tar. The industry was centered in France and England, and later in Germany, whose scientific prowess soon became legendary. It was an aromatic chemical industry exclusively.

Just before World War I, the rapidly growing use of the internal combustion engine spurred the invention of petroleum cracking as a means of obtaining more gasoline from petroleum. This stimulated a new petroleum chemical, or petrochemical, industry by making available large yields of by-product gas rich in olefins. World War I also forced a complete stoppage of chemical imports from Germany and propelled the USA and Britain into a large scale organic chemical industry. In this, synthetic phenol production was central.

Perhaps more than any other development, the synthesis of phenol led to the formation of the giant USA aromatic organic chemical industry, which grew greatly between the wars.

The aliphatic chemical industry, deriving its feedstocks from petroleum or gas sources also grew rapidly, particularly in the hands of Union Carbide, Dow, and Standard Oil Co. (N.J.). In this era, chemical engineering, a primarily American creation, began to be applied to the production of organic chemicals by continuous processes on a large scale for the growing USA mass markets.

World War II contributed major stimuli to the new petrochemical era, with production of synthetic rubber from petroleum-derived butadiene and styrene; plastics manufacture such as polyethylene, polyvinyl chloride, and polystyrene; and of aromatics from petroleum. Because of the availability and cheapness of petroleum based feedstocks, the chemical industry as a whole has undergone an enormous expansion, and these feedstocks have now greatly overshadowed in importance coal tar raw materials. The aliphatic chemicals now dominate the organic chemical scene; petroleum-based aromatic chemicals are staging a new renascence.

In the general area of new or improved processes for utilization of the now more abundantly available aromatic raw materials, the chemical engineering companies of the USA have played an important role along with the more progressive members of the chemical process industries and the chemically minded members of the petroleum industry.

Aromatic Chemicals from Petroleum

(Continued from page 59)

(2) **Phenol:** With the exception of the Dow process, which will be discussed under the toluene section, all known phenol processes start with benzene. Actually, phenol is the second largest derivative of benzene, with production in 1959 of 692,000,000 lb, a 37% increase over 1958 production. About 18% of the benzene produced is used for phenol.

Of the five known phenol-from-benzene processes, only the recently announced Scientific Design process offers a route generally available to the industry which has simultaneously low capital costs and freedom from by-products to be sold or otherwise disposed of in order to make the process economical. The older processes are the benzenesulfonate, chlorobenzene, Raschig-Durez and cumene hydroperoxide processes. In the benzenesulfonate process, benzene, sulfuric acid and caustic soda react to form phenol and sodium sulfates and sulfites. In the chlorobenzene process, benzene is chlorinated and the product is hydrolyzed with caustic soda to obtain phenol, with side products such as salt and diphenyl oxide. In the Raschig-Durez process, benzene, air, water and hydrochloric acid are reacted to produce phenol. A large continuous operation is needed for this process to be economical—by-products are chlorobenzenes, diphenyls, waste tars, etc.

The cumene hydroperoxidation process (developed by Hercules Powder Co. and the Distillers Co. Ltd.) is today one of the most popular processes and has been finding an increasing number of followers in the USA and abroad, particularly in large plants. In this process, cumene is air-oxidized to yield phenol and acetone, and the acetone must be sold to make the process economical. Cumene (isopropyl benzene) can be produced according to two commercial methods by the catalytic alkylation of benzene. In the UOP process, benzene is alkylated using a propane-propylene mixture and a solid phosphoric acid catalyst. In the cumene process licensed by the Mid-Century Corp., formerly an affiliate of Scientific Design Co., and now a subsidiary of Standard Oil Co. (Indiana), cumene is produced in a Friedel-Crafts exothermic liquid-phase reaction, by the addition of propylene to benzene using anhydrous aluminum chloride as a catalyst.

The recently announced Scientific Design phenol process owes its low capital cost to the basic simplicity of the process, and involves in effect, the direct conversion of benzene to phenol with air. No commercial plants have been built at this time to utilize the process, but it is expected that licensees will be announced shortly.

The only other announced processes (by Russian and Japanese groups) to make phenol directly from benzene involve irradiation. Nothing is known in the USA about the commercial feasibility of these techniques.

(3) **Dodecyl Benzene:** Although dodecyl benzene, used principally as a base for synthetic detergents, continues to be the third largest consumer of benzene, its rate of growth is diminishing. About 494 million lb of dodecyl benzene was produced in 1959, about the same as in 1958. Consumption of dodecyl benzene increased steadily until 1958, when the chemical had captured almost 73% of the entire soap and synthetic detergent market. By 1951, it had captured half the market. Although total volume will increase slowly, the annual percentage of benzene devoted to this production will decrease. In 1958, some 10% of benzene was consumed as dodecyl benzene; in 1964, it is estimated that 8.5% of the benzene produced will be so consumed.

(4) **Cyclohexane:** Cyclohexane, which can be prepared from benzene or by extraction from certain refinery streams, is an important intermediate for the ultimate production of cyclohexanol, cyclohexanone, adipic acid, caprolactam, nylon 6 and nylon 66. Cyclohexane production in 1959 was 387,700,000 lb, an increase of 17% over 1958.

Benzene is hydrogenated to cyclohexane by many methods. One of the newest processes, Hydrar (UOP), uses benzene from catalytic reformers. The pure benzene is catalytically hydrogenated to produce high purity cyclohexane, suitable for nylon manufacture. The process is presently in use by Gulf Oil, and a unit has been built for Continental Oil Co. Humble Oil & Refining Co. will also produce cyclohexane by similar techniques. There are also processes in operation abroad for the production of cyclohexane by hydrogenation of benzene. An extractive distillation step followed by distillation is said to result in 98 to 99% purity cyclohexane.

Cyclohexane can be oxidized by air to mixtures of cyclohexanol and cyclohexanone, which in turn can be oxidized to adipic acid. One such process is suggested in a patent issued to DuPont, wherein the oxidant may be nitric acid. Adipic acid and hexamethylene diamine produce Nylon 66. Cyclohexane can also be air oxidized to cyclohexanone, which is a raw material for caprolactam, the monomer for Nylon 6. One of the interesting new trends in the industry is the growth of Nylon 6 as a major new fiber. Its success in tire cords is already evident.

Scientific Design Co. has perfected processes wherein cyclohexane can be used as raw material to produce, by direct air oxidation employing special patented catalysts, adipic acid or cyclohexanone (and thence caprolactam) by varying process conditions, etc. Commercialization will be forthcoming very shortly. Very recently, this company has also developed a very simple and low cost process to make caprolactam in only two steps.

DuPont announced last year that it will produce caprolactam for Nylon 6 by a process in which the preparation of the intermediate cyclohexanone oxime is commercially novel. Essentially the new route appears to comprise nitration of cyclohexane to produce nitrocyclohexane, and the subsequent hydrogenation of this compound to the desired oxime. Cyclohexylamine and probably adipic acid are obtained as by-products.

(5) **Maleic Anhydride—Fumaric Acid:** The only commercial method for maleic anhydride production is by direct air oxidation of benzene, and all maleic to-date has been produced in this manner (although Petro-Tex will shortly commercialize its butene oxidation process in a plant designed by Scientific Design Co.). In 1954, Scientific Design offered its own process for the catalytic direct air oxidation of benzene, employing a patented catalyst and new design and reaction concepts. The only commercially available complete process, it met an enthusiastic reception, and today, 16 companies are licensed by Scientific Design Co. and account for over $\frac{2}{3}$ of the entire world's capacity.

It is rare for a chemical to grow so rapidly; in 1959 production capacity in the USA was about 85 million lb/yr, in 1960 it is estimated at 129 million lb/yr; and is expected to reach 243 million lb/yr in 1961. An ample incentive now exists for the development of new uses for maleic anhydride.

A recent innovation by Scientific Design Co. now makes possible the production of fumaric acid, employing a new catalyst and a simple isomerization process, from streams containing maleic acid. It is being first commercialized by Heyden-Newport. Typical of such streams are maleic anhydride scrubber solutions and phthalic anhydride scrubber solution. Fumaric is now produced by Monsanto, National Aniline, Pittsburgh Chemical and Bzura, using varying techniques. It is probably destined to become a more important industrial chemical than heretofore.

(6) **Aniline:** While most of the aniline produced still comes from the reduction of nitrobenzene by use of iron, newer methods utilize the catalytic vapor phase hydrogenation of nitrobenzene over a copper catalyst. Other catalysts, including nickel aluminum sulfide, have also been claimed to be effective. The vapor phase catalytic process involves large and continuous plants, such as that of National Aniline Division of Allied Chemical Corp. American Cyanamid Co. has a process for catalytic hydrogenation of nitrobenzene over a copper catalyst in a fluidized bed. Aniline production in 1959 was 130 million lb.

(7) **Terephthalic Acid:** Several routes exist for the production of terephthalic acid from benezene. Henkel & Co. have a process using another version of their more familiar techniques in which the potassium salts of aromatic acids are rearranged. In this new version, benzene reacts with potassium carbonate under pressure and at

25 FLUID CATALYTIC CRACKING UNITS

from the smallest to the biggest, with a

total capacity of over 325.000 bbl/day, use

KETJEN KETJENCAT

Fluid Cracking Catalyst

KETJENCAT *users enjoy the following advantages:*

Deliveries in tankcars and tanktrucks with pneumatic unloading facilities

Special overseas packing in one trip King Size containers

Ketjen's special devices for continuous addition and weighing

Ketjen's testing service for equilibrium catalyst

TECHNICAL SERVICE AND CONSULTATION ALSO FOR

KETJEN **KETJENFORM** Fluid hydroforming catalyst. Molybdenumoxide on alumina. Fluid powder.

KETJEN **KETJENFINE** Hydrodesulphurization catalysts
Cobalt- and molybdenumoxide on alumina. Pellets or extrudates.

CK-100/300 Platinum reforming catalysts. 0.3 or 0.6 wt % platinum on ultrapure alumina. Pellets or extrudates.

TAILOR-MADE catalysts. For customers' evaluation available in laboratory or pilot plant quantities.

Sales office:

NEDERLANDSCH VERKOOPKANTOOR VOOR CHEMISCHE PRODUCTEN N.V.

63, Mauritskade, Amsterdam, Holland - P.O.B. 4038 -
Telephone 54322 - Telex 12270 - Telegrams: Chemicals.

KJ-4-30

an elevated temperature to produce potassium terephthalate. The reaction using a cadmium catalyst is carried out in the presence of aluminum carbide. Terephthalic acid is separated from the potassium salt with acid.

Henkel has licensed this version to the companies licensed to use the older process versions utilizing phthalic anhydride or benzoic acid to produce terephthalic acid; e.g., BASF in Germany, Kawasaki and Teikoku in Japan, ICI in Britain, and Hercules in the USA. Production is still relatively small by the Henkel techniques.

Where para-xylene is not available, or is expensive, para-diisopropyl benzene can be used as feedstock in two basically similar processes for producing terephthalic acid by direct air oxidation. In the first process, pioneered by the aforementioned Mid-Century Corp., para-diisopropyl benzene is prepared from benzene and propylene in a single alkylation, and is then oxidized to terephthalic acid in a liquid phase, air oxidation process.

In the process patented in some countries by the Shell group, paradiisopropyl benzene is produced in a two-step process using a new alkylation technique involving a liquid phase reaction in a stirred tank reactor, with a silica-alumina catalyst.

The reactions are: (1) propylene plus benzene to give cumene, and cumene plus propylene to give ortho, meta, para-diisopropyl benzene and 1, 2, 4 and 1, 3, 5 triisopropyl benzenes; and (2) tri-isopropyl benzenes plus benzene to give cumene, and meta- and para-diisopropyl benzene.

The pure para- and meta-isomers are separated by distillation and can then be air oxidized to the corresponding dibasic acid, terephthalic or isophthalic, in a liquid acetic acid medium with a mixture of cobalt and manganese acetates as catalyst. No commercial plants have as yet been built.

TOLUENE

The low cost and ready availability of toluene has been and will even more strongly continue to be a challenge to industry. Mainly because of the relatively few uses for toluene, the Hydeal process was developed to convert it into benzene. The process could have an important significance on the benzene, as well as the toluene and xylene markets, as noted above.

Benzoic acid as a toluene derivative is the basic starting point of many new processes that are attempting to take advantage of toluene's market position. The liquid phase air oxidation process of Mid-Century Corp. can readily oxidize toluene to benzoic acid. This oxidation process will be considered more fully in the xylene section of this paper.

Dow Chemical Co. has pioneered a phenol-from-toluene process that promises to offer considerable competition to other phenol routes, all of which start with benzene. The process, not yet commercialized (although several plants are under construction for Dow interests) consists basically of oxidation of toluene to benzoic acid, conversion of benzoic acid with a copper catalyst to phenyl benzoate, and hydrolysis of phenyl benzoate to phenol and benzoic acid. The benzoic acid can be recycled, and no by-products are left for disposal.

A benzoic acid-to-phenol route has also been patented by Standard Oil of California, who have worked out certain arrangements with Dow.

Snia Viscosa, the large Italian fiber manufacturer, has invented a route to produce caprolactam, the Nylon 6 monomer, from toluene. In their process, toluene is oxidized to benzoic acid and the benzoic acid hydrogenated to form hexahydrobenzoic acid. This is treated with nitrosyl sulfuric acid, and in one step the resulting intermediate compound is decarboxylated and rearranged to form caprolactam. Presumably a variety of other starting materials can be substituted for hexahydrobenzoic acid, but with a corresponding decrease in yield. No commercial plants are yet in operation, although Allied Chemical Corp. has recently acquired the rights to this process in the USA and Canada.

In one version of the Henkel process for producing terephthalic acid, formerly favored by Hercules, toluene is oxidized to benzoic acid, the benzoic acid used to produce potassium benzoate, and two molecules of potassium benzoate disproportionated to obtain potassium terephthalate and benzene. Terephthalic acid is then recovered from the potassium salt with acid. No commercial plant has yet been constructed.

Two toluene-to-terephthalic acid processes use formaldehyde or urea chloride. The latter process was reported in 1957 by the Institute for Technical Chemistry of Martin Luther University, Halle-Wittenberg (East Germany), in collaboration with the F and E Station of VEB Hydrierwerk Zeitz. The process involves the reaction of toluene with urea chloride; the amide of para toluic acid which is obtained is hydrolyzed under alkaline conditions, and the resulting hydrolyzate is oxidized to terephthalic acid in alkaline solution. It appears to be an expensive synthesis.

A more recent process was announced by Bergbau-Forschung GmbH (Essen-Kray, Germany) a research institute for coal producers; it reacts toluene, paraformaldehyde and 33%HCl to obtain a 57-43 mixture of para and ortho isomers of chloromethyl toluene. These isomers are oxidized with nitric acid to the corresponding ratio of terephthalic and phthalic acids, which are then separated. It is being piloted only at present.

Tolylene diisocyanates show promise of continued growth in the manufacture of polyurethane foams and synthetic elastomers. Growth from the present small use is dependent on widespread acceptance of the poly-urethanes, and the relative cost factors of the tolylene diisocyanates as compared with other raw materials, and competitive synthetics.

NAPHTHALENE

As has been discussed earlier, because of the shortage of naphthalene in many locations, an increasingly large part of the phthalic anhydride produced is being made from ortho-xylene. However, phthalic anhydride is produced from naphthalene by air oxidation, and there are three processes employing a fluidized bed catalytic process and a number employing a fixed bed catalytic process.

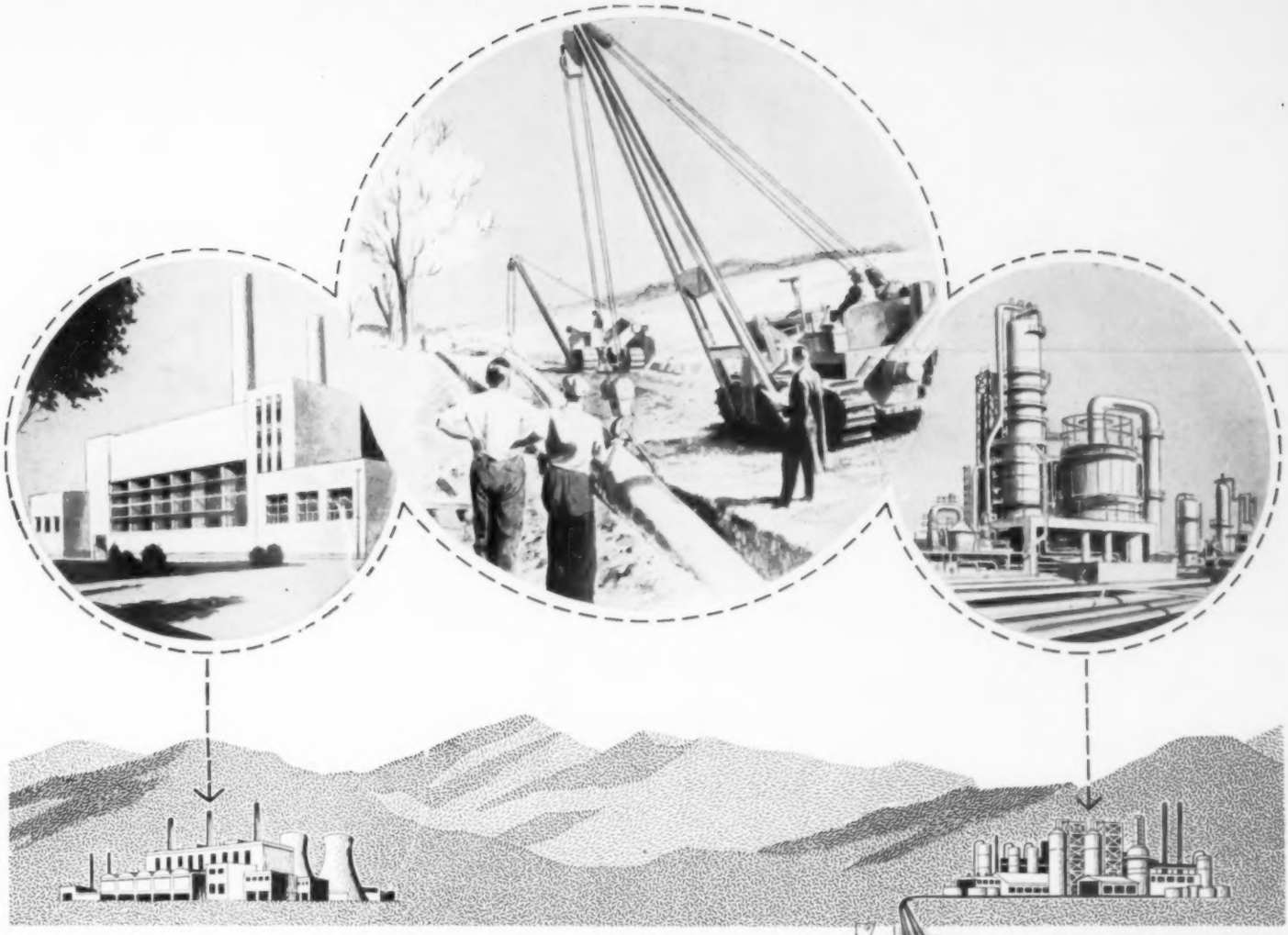
American Cyanamid, Sherwin Williams, and United Steel Co. (England) have their own version of fluidized bed process techniques in commercial operation; a few licenses to others have been granted by the latter two (through Badger Manufacturing and Foster Wheeler). In this method, desulfurized naphthalene is oxidized with air using a vanadium pentoxide base catalyst in a fluidized bed. Among the few fixed bed processes generally available, the Scientific Design process, as an example, employs naphthalene with air in a fixed bed catalytic vapor phase reaction, yielding phthalic anhydride of high purity. The process utilizes novel switch condensers to condense solid crystals of phthalic anhydride. Such switch systems are quite new, but have rapidly replaced hay barns. (Allied and others such as California Chemical use a water scrubber system). It also features a novel balance between high yield and high space velocity catalysts to achieve a new economic optimum.

There has been and continues to be considerable debate as to the relative merits of fixed bed and fluidized bed processes as applied to phthalic anhydride. That there is no clearcut advantage of the fluidized bed process is evidenced by the fact that despite its first commercialization in 1945, it occupies only a small position in the world production picture. Whether this relative position will change will depend on solution of the many difficult technical and economic problems, including long startup time, availability of pure petro naphthalene, catalyst losses, relative cost of naphthalene vs. ortho-xylene (the fluidized bed is not suited to ortho-xylene oxidation), and this in the long run may be its greatest weakness, size of unit and other factors.

XYLENES

Practical processes for oxidizing the xylenes with air had been developed to produce only a few individual aromatic acids prior to the disclosure of a new single step liquid phase air oxidation process that could utilize a mixed xylene feed to produce the corresponding dibasic acids. The same process can be used to oxidize the purified individual isomers, in either a batch or continuous process. This new process was, of course, the Mid-Century or MC process now owned wholly by Standard Oil Co. (Indiana).

In the process, a mixed xylene stream is charged with the catalyst—a heavy metal



COSTAIN & PRESS

A NEW ASSOCIATION

Richard Costain Limited and William Press and Son Limited announce the formation of a new company, Costain and Press (Overseas Services) Limited, with registered offices at 111 Westminster Bridge Road, S.E.1.

The extensive experience of Richard Costain Limited in building and civil engineering has been combined with that of William Press and Son Limited in the field of mechanical engineering and pipeline construction, to provide a service that is capable of undertaking projects anywhere in the world in all fields of construction, especially for the oil, gas, water and chemical industries.

COSTAIN & PRESS
(Overseas Services) LTD.

111 WESTMINSTER BRIDGE ROAD, LONDON, S.E.1. *Telephone:* WATERLOO 4977

and some form of bromine—and often a reaction solvent (because the product acids are solids) into a reactor. Air is passed through the reactor, and the reaction carried out between 125 and 275 C, with pressures up to 40 atm. The resulting solid acids—isophthalic, phthalic, terephthalic, and benzoic—are separated, washed and dried.

In a similar manner, in a simple onestep operation, meta-xylene can be oxidized to terephthalic acid. This is the first process to make terephthalic acid by direct air oxidation in one step. The process can also oxidize mesitylene to trimesic acid, pseudocumene to trimellitic acid, and durene to pyromellitic acid.

Amoco Chemical Co.'s plant at Joliet, Illinois, was designed by Scientific Design Co. to produce all the dibasic acids from a single isomer. To meet changing market demands, product distribution can be controlled by varying the composition of the xylenes used or by charging the pure isomers. In an adjacent plant, some of the acids are converted to the corresponding dimethyl esters.

In addition to the Amoco operation, commercial plants licensed by Mid-Century Corp. and designed by Scientific Design Co. are in operation for Mitsui Petrochemical Industries, Ltd. and Maruzen Oil Co., Ltd., in Japan to produce terephthalic acid from para-xylene. Another plant has been completed by Scientific Design Co. for Imperial Chemical Industries Ltd. in England.

Several other oxidation processes are in commercial use for the production of the dibasic acids. California Chemical is producing isophthalic acid using a California Research Corp. process that employs sulfur, ammonia and water at high pressure and temperature to perform the oxidation of meta-xylene. California Chemical and Amoco are, at present, the only commercial producers of isophthalic acid. However, this chemical is growing in importance, and very possibly there will be more producers.

California Chemical and Amoco are also the only commercial producers in the USA of phthalic anhydride from ortho-xylene. California Chemical employs a vapor phase air-oxidation process (developed by California Research Corp.), promoted by a catalyst based on vanadium pentoxide.

Many foreign producers of phthalic anhydride have shifted to ortho-xylene because of the naphthalene shortage. Foreign ortho-xylene sources are not yet in operation, but for example, Antar in France will have an ortho-xylene unit onstream next year, and British Petroleum-California Chemical in 1962. Most of the ortho-xylene used abroad is exported from the USA, where production was about 62 million lb in 1959, about 115 to 125 million lb in 1960, and could go to 400 million lb in 1961. Some 75% of this year's capacity is earmarked for export to Japan, France, Italy and Germany. Ortho-xylene is separated from mixed xylenes by fractionation. More supplies are available if required, indeed in much greater quantities than are now consumed.

The largest claimed drawback to greater use of ortho-xylene in the USA is the reported low yield of phthalic compared to using naphthalene as a feedstock. Naphthalene advocates insist that they will wait for petroleum naphthalene to come in before expanding production. The real solution to the problem, however, lies in technological process advances and relative economics.

Since ortho-xylene is potentially much more plentiful, and easier to separate than petroleum naphthalene, there probably will be, in the future, a substantial price differential in its favor. Scientific Design Co. has recently made public an important technological advance toward such future large scale utilization of ortho-xylene with the development of a new catalyst for fixed-bed vapor phase processes. The new catalyst when used in Scientific Design's phthalic anhydride process results in yields from ortho-xylene equivalent to those from naphthalene and also permits the alternate use of naphthalene or ortho-xylene, or mixtures of naphthalene and ortho-xylene, depending on market conditions, in the same plant. The flexibility in choice of raw materials together with the high efficiency of the process will reduce the ortho-xylene-naphthalene question to one of raw material cost. A number of chemical manufacturing companies in the USA have operated for varying lengths of time on ortho-xylene when naphthalene is short, but the reduction in capacity that resulted has been a great disadvantage. A newly designed plant can easily overcome this disadvantage. It may also be overcome in many cases in existing plants. Foreign companies are also improving their ortho-xylene oxidation techniques spurred by the naphthalene shortage.

The nitric acid method for the oxidation of para-xylene is used commercially by du Pont in the USA and ICI in England, Rhone-Poulenc in France, Hoechst in Germany and Montecatini in Italy. As mentioned before, ICI's terephthalic acid expansion is using the liquid phase air oxidation process licensed by Mid-Century Corp. It is interesting to note that ICI had been independently researching direct air oxidation processes because of the high cost and other problems associated with the nitric acid oxidation method.

The Imhausen (now Chemishe Werke Witten) and Hercules multi-stage air oxidation process consists of four chemical steps: oxidation of para-xylene to toluic acid, esterification with methanol, oxidation of the remaining methyl group to form the half ester of terephthalic acid, and esterification with methanol to produce dimethylterephthalate. California Research Corp. has patented the basic chemistry of the process in the USA, and Imhausen-Witten has similar foreign patents. Production by this process is also carried out by several companies abroad in addition to Hercules.

Richfield Oil Corp. and Stanford Research Institute have developed a two-stage process involving a catalytic air oxidation to convert para-xylene to toluic acid, followed by nitric acid oxidation of the toluic acid to terephthalic acid. It is not commercial at present.

Olin-Mathieson also seems to have found a set of conditions under which para or meta-xylene can be oxidized with air, but nothing is known about commercialization plans.

In one of the earlier versions of the Henkel process, potassium orthophthalate was made from phthalic anhydride, then isomerized to potassium terephthalate, and terephthalic acid obtained from the potassium salt. Kawasaki has practiced this version commercially in Japan.

In some countries where para-xylene is desired, but cannot be obtained directly by crystallization of petroleum reformer streams as in the USA, or where economics demand a high yield of para-xylene, various processes can be used. In England, Imperial Chemical Industries, Ltd. is commercially operating a plant for the catalytic vapor phase isomerization of mixed xylenes to para-xylene, followed by crystallization of para-xylene and recycle of all of the others to the isomerization plant. Atlantic Refining Co. has an isomerization process, Octafining, that can convert a mixed xylene feed into a high yield of any one of the isomers, for petrochemical use. This process has been used for the first time commercially by Mitsui Petrochemical Industries, Ltd., in a plant now in operation and designed by Scientific Design Co., to maximize para-xylene yield from a mixed xylene feed that otherwise would have only a solvent value. The para-xylene is separated in this case by a low temperature crystallization process licensed by Standard Oil Co. (Indiana).

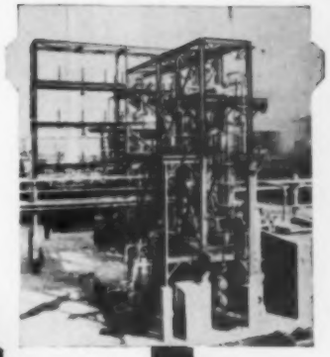
Distillers Co. Ltd. are studying the ammoxidation (reaction with ammonia and oxygen in the presence of a catalyst) of xylenes: they convert xylenes to nitriles, which can be transformed into amines, esters, or amino acids. For example, terephthalic esters can be made from para-xylene through ammoxidation. California Research Corp. has reported that polyamides from m-xylene diamine may find use as fibers. Isophthalonitrile is hydrogenated to this amine by classical methods, and can then be condensed by the approach used in forming nylon—for example, with adipic acid. Phthalonitrile can be made by ammoxidizing ortho-xylene, and could be used as a raw material for phthalocyanine pigments, according to Distillers Co. Ltd.

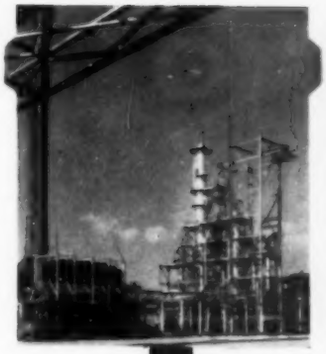
Amoco Chemical Corp. is producing trimellitic anhydride by liquid phase direct air oxidation of pseudocumene and dehydrating the trimellitic acid obtained. Trimellitic anhydride shows promise as a raw material for the production of alkyd surface

(Continued on page 80)

catalysts in action

Spence COMOX catalyst is used for desulphurisation in oil refineries throughout the world. COMOX is noted for its long life, high activity, selectivity and robustness under the most severe operating conditions. Spence Product Development Department will gladly provide further information on COMOX and other catalysts which are available in commercial and development quantities.



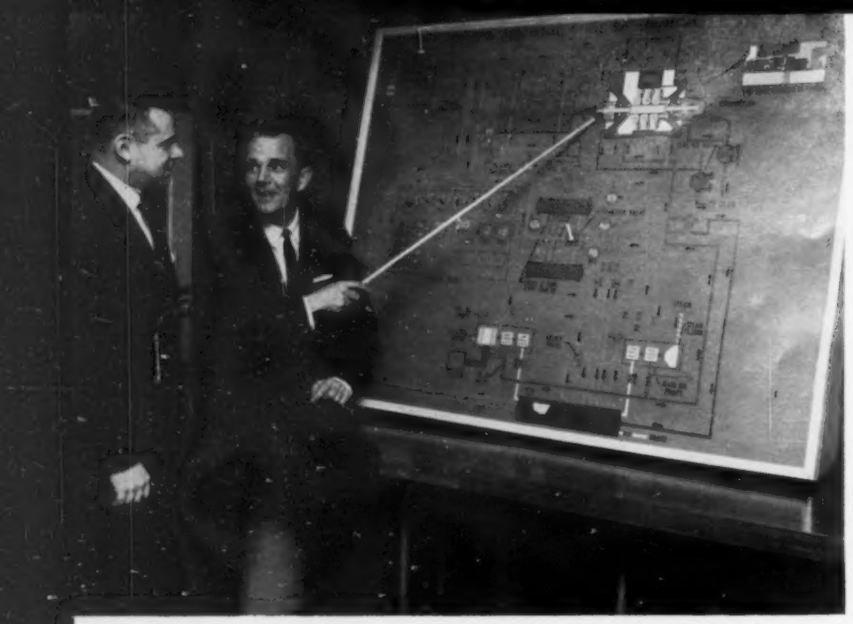


SPENCE

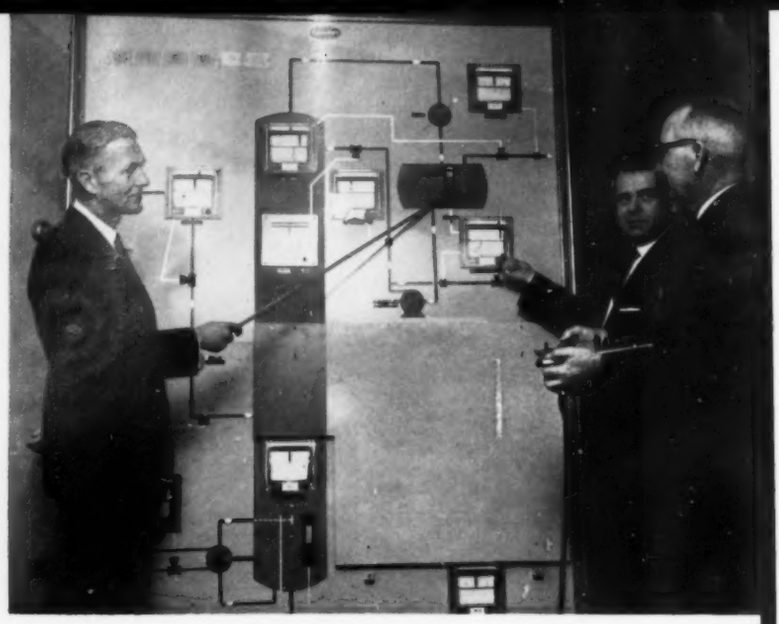
a name synonymous with progress

PETER SPENCE & SONS LIMITED • WIDNES • LANCS. *Also at London, Bristol and Glasgow*

A MEMBER OF THE LAPORTE GROUP L I L



R. N. Rouse, Jr., assistant to training superintendent, Mobil International (and now in Turkey), points to training device for a compressor, as H. D. Sherwood of Socony Mobil's engineering department looks on



Rouse explains details of fractionation column training panel to Sherwood and D. C. Seely, also of Mobil's engineering group. Seely holds a remote control monitor used by instructor

Unique trainers to aid refiners

A NEW CONCEPT in training of process and maintenance personnel — developed from a long-time successful application in aviation—is going into full scale use in the new 62,000 b/d refinery being built at Mersin, Turkey, for Mobil International and an associated group.*

Called simulated training, or "learn-by-guided-doing," the new system follows the basic approach developed in the training devices for aircraft pilots in which the trainee "flies" in a replica of a full size cockpit against simulated flight conditions, but on the ground with no possibility of loss of life or equipment, and at a minimum of cost.

In the refinery training application it will be used in addition to other more conventional techniques such as lectures, on-the-job training, and instruction manuals.

In essence the system, developed by Carmody Corp. of Buffalo, N. Y., utilizes full scale, animated mock-ups of process unit control panels — such as the fractionation column panel and the compressor panels shown in the above pictures—as well as small simulator type panels for such component parts as heaters, heat exchangers, compressors, pumps, valves, instruments, and the like. Both operating principles and start-up procedures are taught by means of these devices.

The contract between Carmody and Mobil for the Turkish refinery provides for a training package comprising a complete set of component trainers and a large control panel simulator for a fractionator column. Carmody has been providing large control panel simulators to the process industries for about six years, but it wasn't until last year that the company, working with Mobil, designed and manufactured the small panels for individual components.

Mobil has also awarded a contract to the company for another package of trainers which includes the control panel simulator for a Thermofor catalytic cracking unit shown above. This set of trainers will be used on a rotational basis throughout Mobil's refineries.

The key to the payoff in this new system is that it allows mistakes to be made in complete safety with no danger to personnel, product, or equipment. Any operation can be repeated as many times as necessary to develop the trainee's confidence in his ability to handle an unusual condition — a minor upset of a major emergency.

The philosophical principle on which the system is based in this. People learn, or retain what they've been taught, in varying degrees depending upon the method. This can range from as low as 10% retention from reading only to as high as 90% from the Carmody-developed approach, which has the trainee doing (performing the task he has been taught) plus talking (telling the instructor what he is doing and why he is doing it).

In practice, the instructor covers the information with the training device through a systematic step-by-step process, and then immediately has the trainee perform with the device. Thus he is able to check continuously on the trainee's understanding and retention by this "feedback."

When the subject matter is very complex, as in a process where many things are happening simultaneously, the instructor can "stop the clock," that is, make time stand still while each phase is fully demonstrated.

A high degree of success has already been attained in training devices Carmody built earlier—a Fluid catalytic cracking unit for Standard Oil Co. (Ohio) at Toledo, Ohio, and a complete control room panel for a du Pont tetraethyl lead plant.

Sohio said that training time spent on this device had yielded three to ten times as much know-how as their conventional methods of training.

The Carmody trainers are being built in three types: (1) specific trainers, such as the large process plant trainer for TEL manufacture, (2) basic trainers, such as the TCC unit, the FCC unit, and the fractionation column panels, and (3) fundamental or component trainers, such as those for pumps, instruments, heaters, valves, etc.

Costs depend upon degree of complexity involved in the panels; ranging from a high of some $32,000 for the custom-tailored specific process trainer, to between $9,000 and $18,000 for custom-built trainers for process units, down to as low as $300 for component units, which can be manufactured on a production line basis.

The trainers are relatively portable, and can be quickly folded into shippable packages for transfer to different locations. Those with animation and lights operate on readily available 110-volt current. Carmody provides complete instruction manuals with each unit. END

*Ownership is as follows: Mobil International, 56%; Royal Dutch Shell, 27%; British Petroleum, 17%.

The Valve Complex on the Shell-B.P. Petroleum Development Company of Nigeria Limited's discovery well at Oloibiri, Nigeria.

The positive tightness of *Newman-McEvoy* VALVES

Automatic sealing, self-aligning gates and non-distorting seats combine to give unquestionable 100 per cent tightness at all times and in all circumstances. An independent sealing system operated by line pressure on each side of the valve stops leakage as it starts. Stem packings and bearings are easily replaced under full line pressure. Proved under hardest working conditions.

NEWMAN, HENDER & Co., Ltd.

WOODCHESTER, STROUD, GLOS., ENGLAND.

Telephone: Nailsworth 360. Telex: 4375

OIL COMPANY STAFF CHANGES

H. A. Jarvis

A. T. Proudfit

ARTHUR T. PROUDFIT has resigned as president of Creole Petroleum Corp. and has been succeeded by **HARRY A. JARVIS.** At the same time, **LEO E. LOWRY** was elected executive vice president, the position formerly held by Mr. Jarvis.

Mr. Proudfit, who retired March 1, has been engaged in the oil business in Venezuela for almost 30 years, going in 1927 from Mexico, where he had worked eight years. On his arrival in Venezuela, he was named superintendent of the Lago Petroleum Corp., a predecessor company of Creole, in Lagunillas. In 1936, he was transferred to Argentina as production superintendent of the Jersey affiliate there, returning two years later to Venezuela as division manager for Standard Oil Co. of Venezuela.

Mr. Proudfit became manager in Venezuela in 1942 and president of Creole in 1945, a position he occupied until Nov. 4, 1954, when he was elected a director of Standard Oil Co. (N.J.) He was named president of Creole the second time in February, 1959, and has served in the post since that date.

Mr. Jarvis has been associated with Creole for 14 years, after 16 years in Argentina with another Jersey company. He was the first manager of the Amuay refinery, a post to which he was named on Jan. 1, 1947. Two years later he was named manager of the refinery department, and in 1950 he became a member of the company's management committee. He was elected a director in 1952 and executive vice president in 1954.

W. R. Stott

P. T. Lamont

WILLIAM R. STOTT, vice president and a director of Standard Oil Co. (New Jersey), has been elected an executive vice president and member of the executive committee, succeeding **EMILE E. SOUBRY,** who plans to retire as a director in May, after nearly 50 years with the company. **PETER T. LAMONT,** a vice president and director with 39 years' service, will also retire, to devote time to personal interests.

Two new candidates will be nominated for election to the Board at the annual meeting in May: **PAUL J. ANDERSON,** Jersey Standard representative for the United Kingdom and Scandinavia and the company's Middle East representative in London; and **W. A. M. GREEVEN,** regional coordinator for Europe, the Mediterranean area and West Africa.

E. E. Soubry

C. H. Wager

H. W. Haight

N. Jones

HAROLD W. HAIGHT has been named an executive vice president of Humble Oil & Refining Co. **NELSON JONES** at the same time moved up to the Humble board of directors from his post as Humble's general counsel. **FORREST M. DARROUGH,** who has been Humble's associate general counsel, succeeds Jones as general counsel. Haight has been a vice president and member of the board of directors of Humble. Formerly president of Creole Petroleum Corp., he joined Humble as a vice president and director a year and a half ago, following service as board chairman of Carter Oil Co., Tulsa, Okla.

FRED H. MOORE has been appointed executive vice president of Mobil Oil Co., Socony Mobil Oil Co.'s operating division for the USA and Canada. He will coordinate the activities of the marketing, manufacturing, supply and distribution, pipe line and traffic departments. Since March 1959 he has headed Mobil Oil's exploration and producing activities as a vice president.

K. R. GERHART to manager of manufacturing for Continental Oil Co.'s petrochemical department and **J. D. BURNS,** formerly assistant superintendent of the Gretna, La., petrochemical plant, to technical assistant to the manager of petrochemical manufacturing, with headquarters in Houston.

WAYNE E. GLENN and **J. P. MALOTT** have been elected vice presidents of Continental Oil Co. Mr. Glenn will become vice president and executive assistant to Chas. A. Perlitz, Jr., executive vice president, and Malott will become vice president and general manager of production.

JOHN T. McCOY, coordinator of Tidewater Oil Co.'s eastern division manufacturing department, has been elected president of the Coordinating Research Council, Inc. H. F. Barr, chief engineer of GM's Chevrolet Motor division, was elected vice president, and E. C. Belefski, assistant treasurer of the American Petroleum Institute, was reelected treasurer.

JOSEPH T. WILSON, Jr. has been elected a director and secretary-treasurer of Sun Oil Co. to succeed John C. Agnew, retired.

JOHN A. McCONE has been elected a director of the Standard Oil Co. of California to succeed Robert Watt Miller, resigned. Mr. McCone was chairman of The Atomic Energy Commission in the Eisenhower Administration.

WILLIAM H. MONTGOMERY, manager of Mobil Oil's manufacturing department since 1959, retired March 1 after almost 35 years' service. For 13 years he held various positions in the Palembang, Sumatra, refinery of Standard-Vacuum Oil Co.

THEODORE W. NELSON has been named manager of production, Socony Mobil Oil Co. Nelson joined the company in 1934 as a petroleum engineer at the Augusta, Kan., refinery. In 1937 he was transferred to the laboratories at Paulsboro, N. J., where he helped to develop the Houdry and Thermofor Catalytic Cracking processes.

CHARLES H. WAGER, general traffic manager for Shell Oil Co. and Shell Chemical Co., has been appointed chairman of the Central Committee on Railroad Transportation of the American Petroleum Institute. He has served for several years as one of the committee's three vice chairmen and has been with Shell for over 30 years.

BERT B. MEEK, JR., has been named treasurer of the Pan American International Oil Corp. Formerly assistant treasurer of the firm which he joined in 1959, Meek is a member of the American Bar Association, the California and New York Bars and has been admitted to practice before the U. S. Supreme Court.

E. F. BULLARD and **L. W. MOORE** have been elected to the board of Standard Oil Co. (Indiana). Bullard is chairman of Pan American Petroleum Corp., wholly-owned exploration and production subsidiary of Indiana Standard, and Moore is president of American Oil Co., national marketing and manufacturing subsidiary.

WALLACE E. AVERY has been elected vice president in charge of West Coast operations of Texaco Inc, effective May 1. Avery, who has been secretary of Texaco since 1956, will make his headquarters at Los Angeles. **MAURY L. NEE,** formerly director of the budget, has been elected secretary to succeed Mr. Avery.

H. D. KINSEY elected a vice president of Union Carbide Corp. and **PAUL L. ALSPAUGH** appointed president of Union Carbide Olefins Co., division of the Corporation.

PAUL E. MOSTINI to executive assistant to the assistant general manager of producing and manufacturing for Mobile Oil Francaise, an affiliate of Mobil International Oil Co. Mostini had served Mobil for 19 years in West Africa. He was formerly general manager for Mobil Oil Cameroun and Equatoriale Africa. **JEAN MOULIER,** formerly district sales manager in Equatoriale Africa, will replace Mostini in the Paris liaison office.

GEONISIO BARROSO has been named head of the state oil agency, Petrobras. Barroso has been a geologist and chief of production for Bahia fields.

P. C. LIVESAY to coordinator of manufacturing and purchasing for Standard Oil Co. (Indiana). Formerly refinery manager of Sugar Creek, Mo., he has been deputy coordinator of manufacturing for the company since Jan. 1.

Three new appointments in the manufacturing department of Amoco Chemicals Corp., include **C. L. PARRIS** as plant manager of the recently announced operation at Haverhill, Ohio, **JERALD D. REED** plant manager at Joliet, Ill. succeeding Parris, and **FRED F. DIWOKY** replaced Reed as manager at Texas City.

R. E. KREIDER to manager of Mobil Chemical Co.'s development division, from petrochemical coordinator of Standard-Vacuum Oil Co.

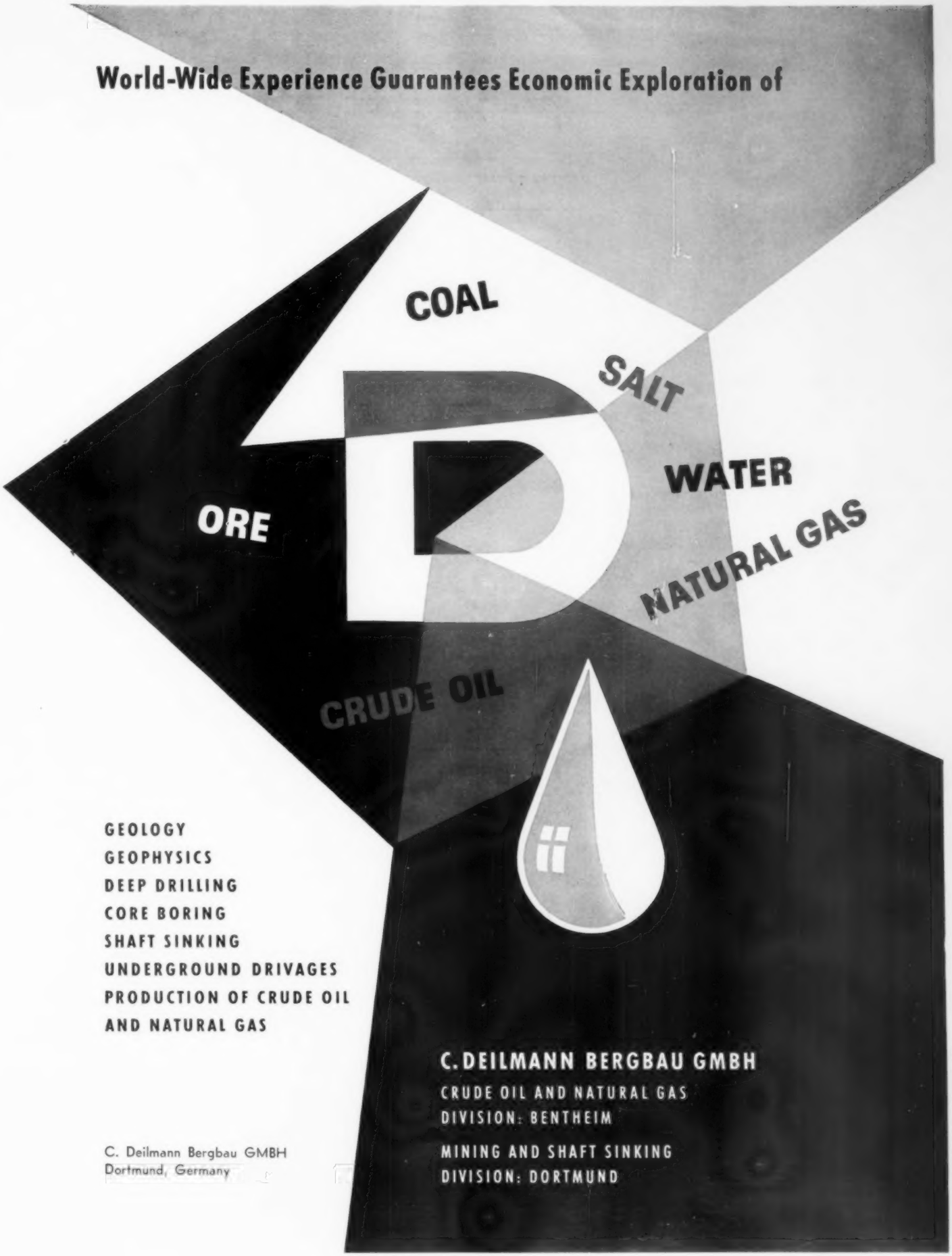
ROBERT P. LUCAS and **BORIS S. VOUKOVITCH,** who recently have returned from six months in Libya, have moved their offices to Suite 326, Denver National Building, Denver 2, Col.

JAMES V. C. MALCOLMSON, general manager of the marine department of Texaco Inc. has been elected a vice president of the company.

RAY C. ADAM has been named vice president and general manager of manufacturing for Mobil Oil Co., a newly created position in which he will be responsible for Mobil Oil's 12 USA refineries. Mr. Adam joined the company in 1946 as a process engineer at the Beaumont, Tex., refinery. Early last year he became manager of planning and analysis, and later in 1960 was promoted to manager of planning, analysis and economics.

T. W. Nelson

R. C. Adam


World-Wide Experience Guarantees Economic Exploration of
COAL
SALT
WATER
NATURAL GAS
ORE
CRUDE OIL
GEOLOGY
GEOPHYSICS
DEEP DRILLING
CORE BORING
SHAFT SINKING
UNDERGROUND DRIVAGES
PRODUCTION OF CRUDE OIL
AND NATURAL GAS
C. DEILMANN BERGBAU GMBH
CRUDE OIL AND NATURAL GAS
DIVISION: BENTHEIM
MINING AND SHAFT SINKING
DIVISION: DORTMUND
C. Deilmann Bergbau GMBH
Dortmund, Germany

W. H. Walker

H. S. Brewster

WAYNE H. WALKER has been elected vice president, administrative, for Pan American International Oil Corp. He has served as manager, administrative and director of the company since 1958. Formerly, he was with the parent Pan American Petroleum Corp., which he joined in producing field operations in 1937.

WALTER E. MACDONALD to manager, negotiations for Pan American International Oil Corp., responsible for the implementation of all policies and programs concerned with the administration and acquisition of concessions, exploration-exploitation contracts and all other land activities in which Pan American International may engage.

GUILLERMO RODRIGUEZ-ERASO, special assistant to the president, has been elected to the board of directors, Creole Petroleum Corp.

Venezuelan-born, Rodriguez is a graduate of the School of Geology of Central University of Venezuela in Caracas and also holds his master's degree in geology from Stanford University. He joined Creole in 1945 after graduation from Central University.

WILLIAM F. CHRISTIE and **DON R. CARMODY** to newly created positions in the marketing department of Amoco Chemicals Corp. Mr. Carmody becomes director of overseas market research and Christie director of market research in the United States.

MARTIN A. ROW to special counsel for foreign operations in Sun Oil Co.'s production department, succeeding John W. Timmins, who has retired.

HERBERT S. BREWSTER has been appointed director of operations for Gulf Oil Corp.'s marine department. He will direct the overall operations of Gulf's tanker fleet in its domestic and world-wide operations, and succeeds J. Robert Thompson, resigned.

L. MILLARD GELVIN to assistant to the president of Sunray Mid-Continent Oil Co. from assistant treasurer and also as assistant treasurer for DX Sunray Oil Co., refining and marketing subsidiary.

E. R. BAKER to general manager of Continental Oil Co.'s research and development department and petrochemical department from general manager of the petrochemical department.

ALEXANDER GAKNER, expert on the Soviet mineral economy, has resigned from the Bureau of Mines to become assistant vice president, International Division, Royer and Roger, Inc. Last summer he represented the Bureau of Mines on the team of experts from the United States petroleum industry that inspected a large part of the Soviet oil industry.

LOUIS W. GARDNER to director of the geophysical research division, Gulf Research & Development Co. succeeding **Dr. T. J. O'DONNELL**, recently named associate director of the Gulf Laboratories.

WALTER G. HORSTMAN, vice president-operations of Plantation Pipe Line, has retired after 38 years in the petroleum industry. **JAMES A. HATFIELD** formerly general superintendent, has taken over the operational activities of the company. Mr. Horstman started his career with the Shell Oil Co. in 1923 as a gauger at the Wood River, Ill., refinery. In 1941, he became division superintendent of the newly formed Plantation Pipe Line Co. and in 1952 he was made vice president-operations.

DOUGLAS G. G. LEVICK, from marketing coordinator of Standard-Vacuum Oil Co. to Standard Oil Co. (New Jersey) as marketing advisor for the Far East and South and East Africa.

EARL M. KIPP, special consultant—producing problems on the staff of the director and vice president in charge of producing and exploration for Standard Oil Co. (Calif.) has been elected 1961 president of the Society of Petroleum Engineers of AIME (American Institute of Mining, Metallurgical and Petroleum Engineers).

MICHEL NEUMAND to sales manager for United Carbon's new French subsidiary, United Carbon France, S.A., and **H. L. KIRCHSCHLAGER** to product manager for sales to South America and Mexico. Neumand will be located at United Carbon France, S.A., 7 Avenue George V, Paris VIII, France, and Kirchschlager will be located at 410 Park Avenue, New York 22, N. Y.

California Chemical International, Inc., overseas marketing affiliate of California Chemical Co., has named **DAVID KNAPP** director and vice president in charge of European marketing activities for industrial chemicals sold by Cal Chemical's Oronite Division. He will be headquartered at California Chemical International's offices in Geneva, Switzerland.

STEWART P. COLEMAN, a vice president and member of the board of Standard Oil Co. (New Jersey), has retired for reasons of health, effective April 1, 1961.

A native of Corpus Christi, Texas, Coleman started in the oil business with Humble Oil & Refining Co., a Jersey Standard affiliate, as a chemical engineer after his graduation from Rice Institute in 1920.

He joined Jersey Standard in 1933 as manufacturing representative on a central study and advisory committee for Jersey affiliates of which he later became chairman. When the company formed its coordination and economics department, he became its first man-

(Continued on page 72)

Stovepipe welding the 60 mile 18" diameter pipeline from the British Petroleum Co. Ltd's Llandarcy Refinery to their new deep water terminal at Angle Bay, South Wales. Lincoln SAE 300 Diesel Engine Driven Welders, Improved Fleetweld 5 and Shield Arc 85 electrodes were used exclusively by the Main Contractors, George Wimpey and Co. Ltd.

FIRST IN THE FIELD—STILL IN THE LEAD

Welders and Electrodes for *FAST* Pipeline Construction

FROM THE SA 150 Junior to the SAE 600 for automatic welding, there is a complete range of Lincoln Electric Co. Ltd. Engine Driven Mobile Welders covering every field welding requirement.

Every Lincoln Mobile Welder incorporates Lincoln Electric Co. Ltd's 30 years of unrivalled experience in the manufacture of engine driven welding sets for tough, reliable performance under the severest operating conditions.

They can also be used to supply current for power tools etc. if desired—an important *PLUS* feature that makes Lincoln Welders, like famous Lincoln Electrodes, Improved Fleetweld 5 and Shield Arc 85, the first choice for welding in the field!

Write for further information to:

LINCOLN ELECTRIC CO LTD WELWYN GARDEN CITY · HERTFORDSHIRE · ENGLAND

Tel: Welwyn Garden 4581 *Cables:* Shield-Arc · Welwyn Garden City

A MEMBER OF THE GKN GROUP OF COMPANIES

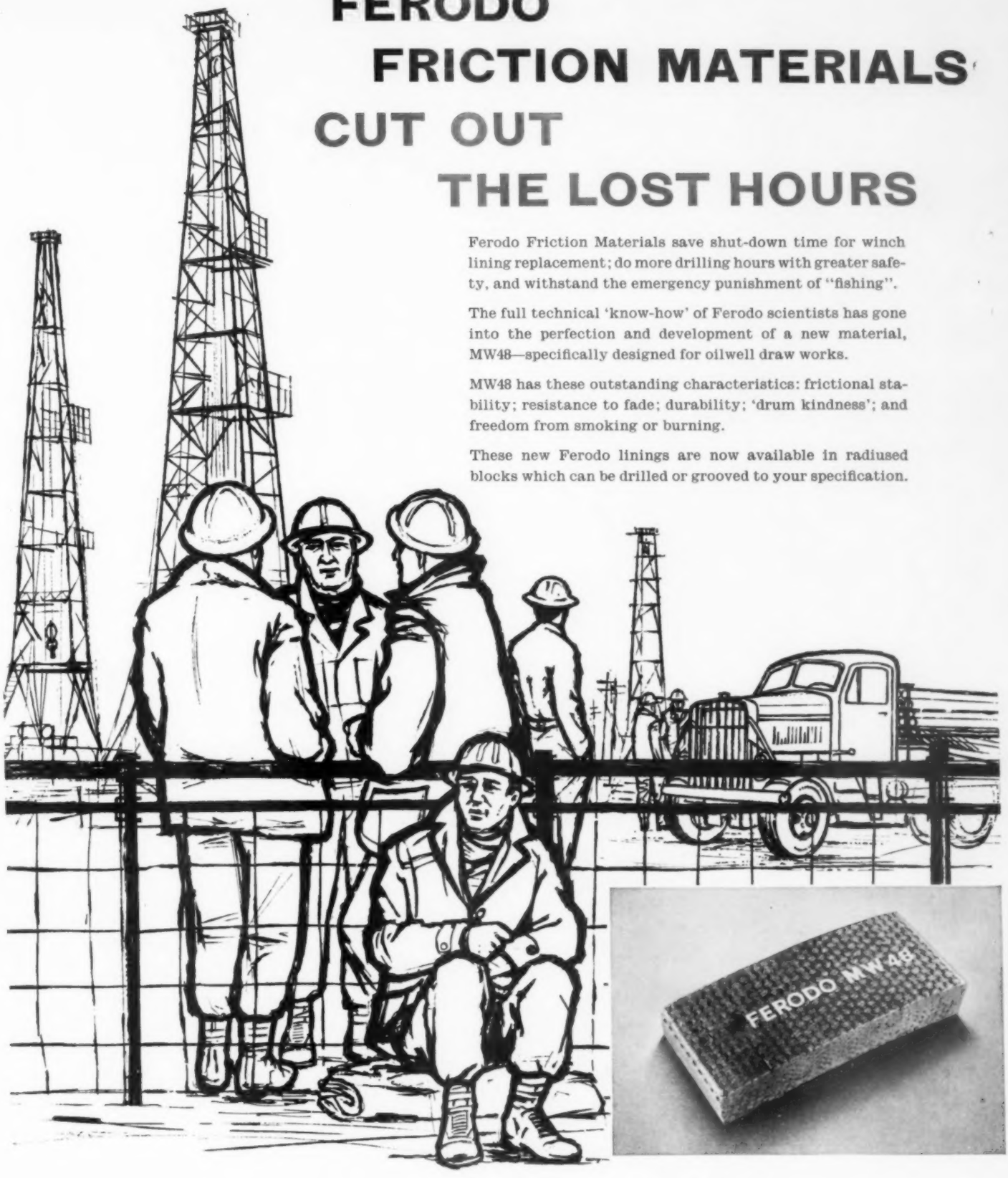
FERODO FRICTION MATERIALS CUT OUT THE LOST HOURS

Ferodo Friction Materials save shut-down time for winch lining replacement; do more drilling hours with greater safety, and withstand the emergency punishment of "fishing".

The full technical 'know-how' of Ferodo scientists has gone into the perfection and development of a new material, MW48—specifically designed for oilwell draw works.

MW48 has these outstanding characteristics: frictional stability; resistance to fade; durability; 'drum kindness'; and freedom from smoking or burning.

These new Ferodo linings are now available in radiused blocks which can be drilled or grooved to your specification.



FERODO FRICTION LININGS

FERODO LIMITED · CHAPEL-EN-LE-FRITH
DERBYSHIRE · ENGLAND
A Member of the Turner & Newall Organisation.
Ferodo supplies and service available throughout the world.

EX 116

ager. He was elected a director in 1946, a vice president in 1955, and served as chairman of the Coordination Committee from 1954 to 1960.

During the war Coleman was with the Petroleum Industry War Council and Petroleum Administration for War as director of the program division. He is a member of the Military Petroleum Advisory Board and the Foreign Petroleum Supply Committee and served as chairman of the Middle East Emergency Committee, all of which are or were consulting groups to the United States government.

E. W. WEBB, senior vice president of Continental Oil Co., has retired after being associated with the production phase of the oil industry for 40 years. He worked for six years with another oil company before joining Conoco in 1927. A production foreman at Seal Beach and Ventura, Calif., during his early years with Conoco, he was ultimately transferred to the executive offices in Houston in 1950, elected a vice president the following year and senior vice president in 1958.

GEORGE H. RENEAU to manager of production and chief engineer; and **LEONARD SWORDS** to manager of exploration, Alco Oil and Gas Corp.

JOHN M. WHELAN, who started as a rate clerk for the American Oil Co., and rose to the position of general traffic manager, retired March 1 after 38 years of company service. Since January 1, 1961, he has served as a consultant on traffic in the corporate consolidation by which American Oil became the national operating affiliate of Standard Oil Co. (Indiana). In 1959, Whelan was awarded the American Petroleum Institute's Certificate of Appreciation for services rendered as a committee member for the Institute's Division of Transportation.

JOSEPH V. MURRAY

Joseph V. Murray who retired in 1954 after 37 years' service with Texaco Inc., and California Texas Oil Corp., died Feb. 10, at St. Petersburg, Fla. He was 72 years old. Mr. Murray spent a large part of his career in the Far East, serving in executive marketing capacities in Australia, India, Japan, New Zealand, and the Philippines. In 1936, when Caltex was formed, he joined the new organization as a director and was active in the postwar expansion of the Caltex companies.

CHARLES J. RELLER

Charles J. Reller, 57, secretary and treasurer of The Atlantic Refining Co., died January 28 of a heart attack at his home in Hartsville, Bucks County, Pa. He had been with Atlantic nearly 35 years. He became treasurer in 1955 and was elected secretary and treasurer last November.

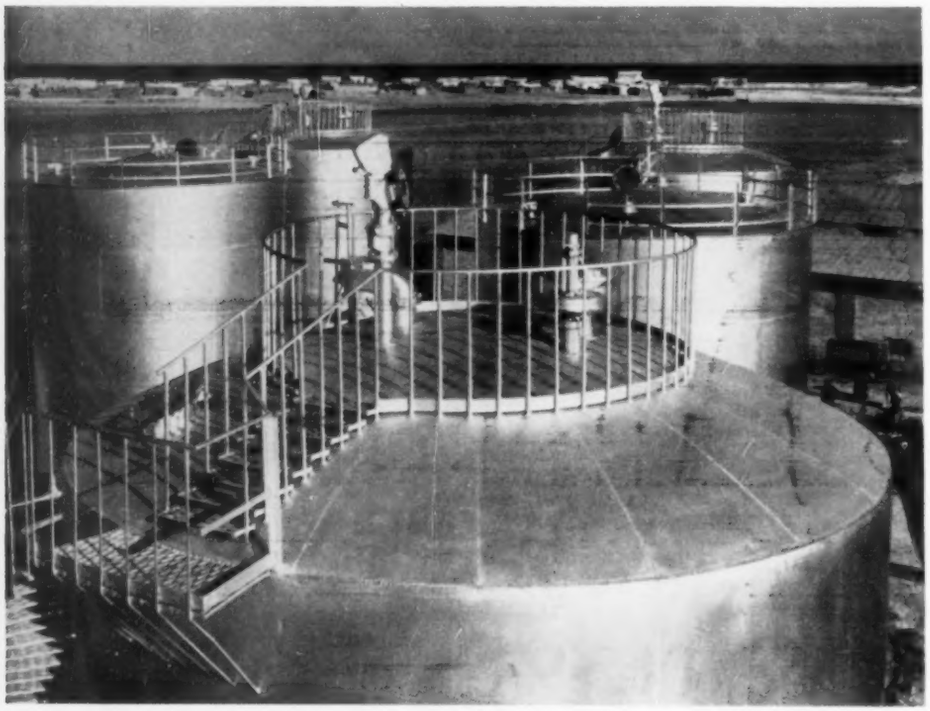
JOHN HALL GRUBB

John Hall Grubb, vice president and manager of the international division of Cameron Iron Works, Inc., died January 25, 1961, in Houston, after an illness of several months. Mr. Grubb spent a large part of his life in oilfields throughout the world. He joined Cameron in 1955 and for the past two years has been manager of the international division.

ROBERT FRANK ALDREDGE

Robert Frank Aldredge, 65, died Jan. 23 in Mexico City of a heart condition. He was vice president of Seismograph Service Corp. of Mexico, a position he had held since 1945. Mr. Aldredge had worked for Seismograph Service in Venezuela, Colombia, Argentina and Iran.

CONTRACTORS TO THE OIL INDUSTRY



"BP" (Eastern Agencies) Ltd. Sharjah Trucial Coast—Tanks supplied and erected by us.

Suppliers and Builders of Steel Tanks of all kinds.
Pressure Vessels, etc.
Civil Engineering and Building Contractors.
Pipe lines, pump stations, power stations, degassing stations, steel buildings, residential and office buildings, etc.

MOTHERWELL BRIDGE CONTRACTING AND TRADING COMPANY, LTD.

Offices and Branches in:

Baghdad • Kirkuk • Basrah • Damascus • Kuwait • Bahrain • Qatar
Aden • Karachi • Nicosia • Tripoli • Benghazi • Teheran • West Africa

London Office: 23 Princes Gate, London. S.W.7. (Tel. Knightsbridge 0701)
Middle East Headquarters . . . P. O. BOX 1036, BEIRUT, LEBANON

Chicago Pneumatic Promotes Griffin

By recent appointment C. L. Griffin, formerly general sales manager of the Oil Tool Division of Chicago Pneumatic, has been named general manager of that division. In his new position, Mr. Griffin will continue his supervision of the sales activities as well as all other phases of the Oil Tool Division's operations.

Prior to his association with Chicago Pneumatic, Mr. Griffin was vice president in charge of sales for the Security Engineering Division of the Dresser Industries. He has been closely associated with the petroleum industry for the past 26 years. A graduate of the Colorado School of Mines, Mr. Griffin will continue to make his headquarters at the Oil Tool Division's manufacturing facility at Fort Worth.

Mr. Griffin replaces Mr. G. A. May who has been elevated to executive vice president and general manager of the Allen Manufacturing Co., Bloomfield, Conn., a wholly-owned subsidiary of Chicago Pneumatic.

World Tanker Tonnage

The half-yearly analysis of world tanker tonnage compiled by Davies & Newman Ltd., London ship and oil brokers, reports the total of such vessels (500 tons gross and over) afloat on January 1 at 66,931,293 dwt, a net increase of 1,265,017 dwt during the second half of 1960. During last year 202 tankers of about 2,692,000 dwt were sold for scrap or conversion. The leading fleets and the half-year's changes were:

	1961 January 1	1960 July 1
	Deadweight tons	
Flag—		
Liberian	11,652,868	12,006,661
British	10,953,573	10,928,241
Norwegian	9,936,517	9,663,037
United States	6,992,312*	6,905,415*

*Commercial fleet only.

The most interesting change, however, is the continued rise in Greek flag vessels—to 2,097,361 from 1,525,355 dwt—as a result mainly of change of flag from the Liberian.

World tanker tonnage laid up for lack of employment lessened by 346,361 gross tons over the quarter to the beginning of February, according to statistics issued by the Chamber of Shipping of the United Kingdom compiled from information received at Lloyd's. This excludes, inter alia, coasters and certain vessels normally engaged on short voyages.

Of this February 1 total, tankers amounting to 262,827 tons (13.8%) were built 1939 and earlier, and 1,267,357 tons (66.5%) before 1946. Thus the majority of such vessels are not likely to return to service.

IN ENGLAND

Dewrance & Co. Ltd., London
Ashcroft Duragauges
Ashcroft Pneumatic Transmitters
Consolidated Safety Relief Valves
Consolidated Safety Valves
Consolidated "Maxiflow" Safety Valves
Consolidated "Electromatic" Relief Valves

IN AUSTRIA

Hubner & Mayer, G.m.b.H.
Consolidated Safety Relief Valves
Consolidated Safety Valves

IN WESTERN GERMANY

Deutsche Babcock & Wilcox Dampfkessel-Werke, Oberhausen (Rheinl)
Consolidated Safety Relief Valves
Consolidated Safety Valves
Consolidated "Maxiflow" Safety Valves

IN CANADA

Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario
Ashcroft Gauges
Consolidated Safety and Safety Relief Valves
Hancock Bronze and Steel Valves
American Bi-Metal Thermometers
American Temperature Regulators

IN ITALY

Societa Carraro & Co., Milan
Consolidated Safety Valves
Hancock Temperature Regulators
Filotecnica Salmoiraghi—SPA, Milan
Ashcroft Duragauges

IN FRANCE

Sapag, Paris
Consolidated Safety Relief Valves
Hancock Steel Gate and Globe Valves
Hancock Steel "Flocontrol" Valves

IN BELGIUM

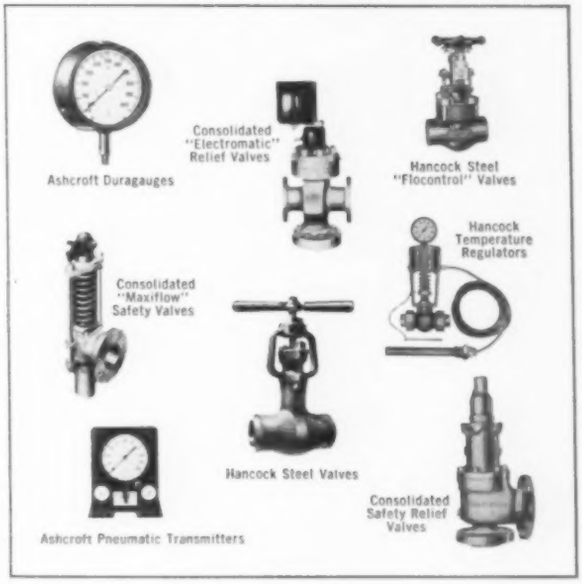
Ateliers Jasper, S.A., Liege
Consolidated Safety Valves

Serving the petroleum industry 'round the world

Swing across the face of free Europe, to Africa, Asia, and the Far East . . . go south of the border to Latin America, or north to Canada. Dip down under to Australia. Follow all four points of the compass to the petroleum industry wherever it exists — and there you will find products of Manning, Maxwell & Moore, Inc.

The reason: licensees with a long-standing reputation for engineering and manufacturing integrity, distributors and sales agents whose business has been built on service. These well-known companies will meet your exacting needs in pressure gauges, industrial instrumentation, and valves, all products of Manning, Maxwell & Moore that have earned wide preference in the United States for over a century.

Whether you are planning new facilities or modernizing existing processes, we welcome the opportunity to assist with experienced counsel and specific product data.



MANNING MAXWELL & MOORE INC. TRADE MARK

MANNING, MAXWELL & MOORE, INC.

All Areas Except Western Hemisphere: Manning, Maxwell & Moore, S. A., Fribourg, Switzerland
Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario
Latin America: Export Division, Chrysler Bldg., New York, N. Y.

INTERNATIONAL NEWS AND NOTES

ADEN—The recent maiden voyage of the new Orient line "Oriana" provided the first major test of the £200,000 modifications and improvements by British Petroleum at its Aden bunkering terminal. A maximum loading rate of nearly 1,600 ton/hr was achieved, and over 5,000 tons of bunker fuel was loaded in four hours, nearly twice as fast as the best rate previously achieved.

ALASKA—Interior Secretary Udall has approved a five-year 500,000-acre oil and gas contract for exploration by Pure Oil Co. in the Nushagak Bay development area, north of the Alaskan peninsula and some 300 miles southwest of Anchorage. This agreement is the 9th development contract currently outstanding in Alaska. About 5,100,000 acres are included within the nine-contract area.

ALASKA—Alaska Sinclair Oil and Gas Corp. and BP Exploration Co. (Alaska) Inc., have joined Richfield Oil Corp. in exploration operations in the Katalla-Yakataga area of the Gulf of Alaska. An option to acquire a one-half interest in the operation was exercised by Sinclair, and one-half of Sinclair's interest was assigned to BP Exploration Co. (Alaska) Inc. Richfield will be the operator for the group.

ALGERIA—Crude oil exports from the port of Bougie came to 6,561,088 metric tons last year. All the crude came from the Hassi Messaoud field. Bulk of Bougie oil has been going to France, with smaller amounts to Holland and West Germany.

Exports from the port of La Skhirra, which began in September, came to 1,510,725 tons. This crude comes from the fields of Zarzaitine and Edjeleh. Exports in December, the peak month to date, were at an annual rate of 6.9 million tons, close to the capacity of the Edjeleh-Tunisia pipeline, which is 7.2 million tons. Majority of the La Skhirra oil has been for the account of Royal Dutch Shell, with smaller amounts bought by British Petroleum, Esso Standard, Mobil Oil and a new French distributor, Union Industrielle des Petroles.

AUSTRALIA—Burmah Oil Co. (British-owned) has acquired an interest in offshore rights held by Australian Pacific Oil Co., south of Adelaide, including part of Kangaroo Island and extending to the Victoria state border. Only preliminary surveys are planned now.

AUSTRALIA—Texas American Oil Corp. of Midland, Tex., and Landa Oil Co. along with Nortex Oil & Gas Corp. of Dallas have made joint announcement of the formation of a new Australian oil and gas firm, United Australian Oil, Ltd. The three firms have combined their Australian concessions into one company in order to spread costs and risks and to provide more greatly distributed and diversified interests in that country.

The new concern will have about 28 million acres of oil and gas concessions in the states of Queensland, Northern Territory and New South Wales.

AUSTRALIA—Total capital investment in refineries and associated petrochemical plants in Australia will exceed $600 million within the next three years, according to the Minister for National Development, Senator W. Spooner. Present total capital expenditure was estimated at $350 million, with additional investment planned within the next two or three years of more than $100 million.

Consumption of products has increased by 28% in the last four years, but the cost to the country had increased by only 6%. In the same period petroleum exports increased from $18 million to $40 million.

A well is to be drilled by Santos Ltd. at Mornington Island in the Gulf of Carpentaria. Delhi Australian will share in the well, a 6,000-ft stratigraphic test.

AUSTRIA—The Austrian State company OeMV will invest during 1961 about $25.4 million, 14% less than during 1960. Completion of the Schwechat refinery has resulted in a cut in the processing field to $11.8 million for 1961 from $19.2 million in 1960. $4.6 million has been earmarked for drilling; total footage is to reach 538,100 ft (587,300 ft in 1960). Investment for the gas industry has been trebled to $2.6 million for 1961 ($820,000 in 1960), of which $1.6 million alone is to be spent for the new Aderklaa gas field. Planned is construction of a 35.3-million-cubic-foot-per-day desulfurizing plant to be completed in 1962.

BELGIUM—An exclusive permit covering 375,600 Ha. (one Ha. equals 2.5 acres) has been granted to the Societe Campinoise de Recherches et d'Exploitations Minerales. The company, formed by seven coal mines, has a contract with Petrofina. The permit is exclusive and for 50 years. Terms call for start of exploration within three months from permit issuance, and spending of 40 million francs in the first five years, and at least 5 million francs a year after that.

An exclusive permit covering 263,000 Ha. has been granted for 50 years to the Bataafse Petroleum Maatschappij of the Hague. Research work must start within six months of the grant of rights and 40 million francs must be spent in first five years and five million francs a year after that. The company may renounce all or part of its rights.

BURMA—General Exploration Co. of California has obtained a 10,000-square-mile exploration concession in the Irrawaddy basin of Burma. This is the first such grant to a foreign firm outside the 50% government-owned Burma Oil Co. (1954) Ltd.

BURMA—Until Burma can expand her refining capacity, the Burma Oil Co. (1954) Ltd., owned 51% by Burmese government and 49% by British oil firms, has been authorized temporarily to import Russian oil products—at prices reported well below current posted prices. Payment will be in local currency.

CAMBODIA—Cambodia's chief of State, Prince Norodom Sihanouk, has requested Soviets to aid his country in a mineral survey, including oil. Russians are said to be receptive. Meanwhole Polish government is said to be negotiating with Cambodia for oil exploration in the Mekong valley.

FRANCE—Franc-zone crude output is expected to increase to about 400,000 b/d during 1961, 72% over 1960, according to the French government's petroleum bureau. Sahara and Algeria are estimated to supply about 340,000 b/d, up from 177,000 b/d in 1960; metropolitan France 44,000 b/d, slightly over 39,000 b/d in 1960; and Gabon and the Congo 17,000 b/d, same as in 1960.

FRANCE—The French Saharan oil and gas operator, SN Repal, has applied for a 787-square-mile exploration permit in France—including offshore rights in the southwestern part of the country, in Gironde, Landes, and Lot-et-Garonne.

FRANCE—Union Generale des Petroles is teaming up with La Mure to form a new distribution company, presumably for products from UGP's Sahara crude. The move is expected to bring UGP's share of the French market up to 6%. UGP last year took over the Caltex France refining, transportation and distribution facilities. La Mure is to operate the new enterprise. It has 46 gasoline stations.

FRANCE—Societe Nationale des Petroles d'Aquitaine at Lacq, Basses-Pyrenees, produced a total of 98,850 cubic meters of crude oil last year, against 107,350 cubic meters in 1959.

FRENCH SAHARA—No. 1 Tin Fouye, promising wildcat in Takouazet permit in the eastern Sahara, recently flowed 63 bbl per hour on test at 4,265 ft in the Devonian. The permit, which is 137 miles west of Zarzaitine, is owned 50-50 by CREPS and Cie. des Petroles d'Algeria. Shell owns 35% of the former and 65% of the latter firm.

FRENCH SAHARA—No. 1 Nezla, in the Hassi Toureg permit of the French Sahara, has been tested at the rate of 13.5 mmcf/d of gas from three zones between 8,157 ft and 8,388 ft. Phillips Petroleum holds 25%; and the operator, COPEFA, and Omnirex (another French firm) each holds 37½% in the venture.

GREECE—Crude oil imports last year were 1,724,190 metric tons. Some 804,576 tons came from Iran; 482,036 tons from Saudi Arabia, and 437,578 tons from the Soviet Union.

INDONESIA—An Indonesian government committee has begun talks with oil companies concerning conversion of existing rights to the new terms under a decree passed during 1960, as well as on a possible solution to pressing tax matters under which the major oil companies might face taxes totaling 85%.

IRAN—In denial of previous reports that the Italian State oil agency ENI intended to quit Persian Gulf exploration on three Iranian tracts held jointly with NIOC, ENI's Mattei has confirmed to NIOC chairman Abdullah Entezam that ENI will continue in the cooperative activities of the two agencies.

IRAQ—Crude oil production by three companies was 46,534,398 long tons last year, a gain of 5,636,722 tons over 1959. Iraq Petroleum Co. output was 33,841,608 tons, up 6,510,499. Basra Petroleum Co. output was 11,396,379 tons, down 900,783. Mosul Petroleum Co. output was 1,296,411 tons, up 26,006 tons. Basra's drop is attributed to a temporary suspension of production in July and August.

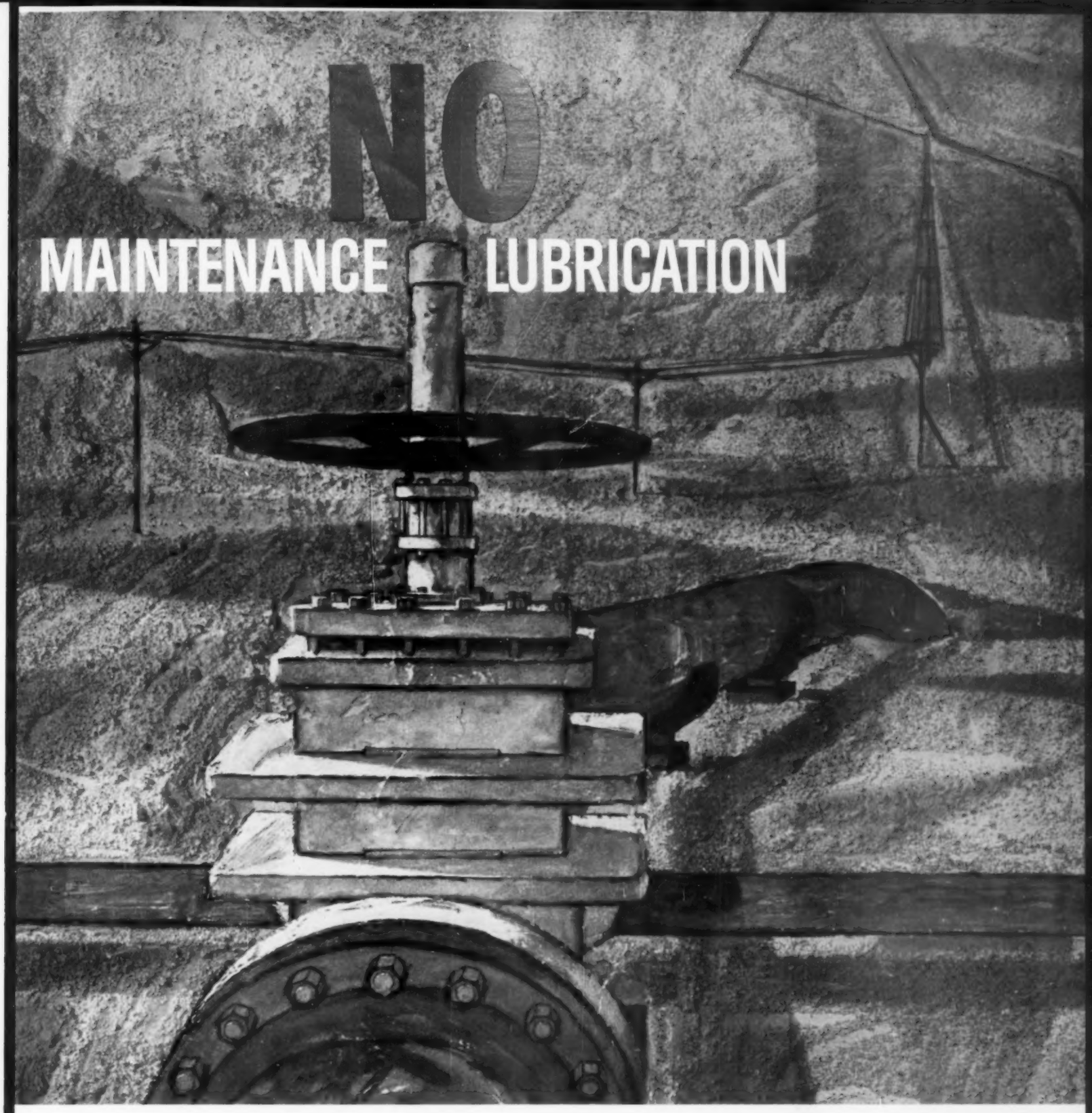
JAPAN—Under a trade pact recently signed in Moscow, imports into Japan of Russian oil should increase to 1.7 million tons for the fiscal year starting April 1961 from estimated one million for current fiscal year. New target would account for about 6% of Japan's total estimated oil imports.

KENYA—BP-Shell Petroleum Co. of Kenya will spend £1 million on prospecting in Kenya under a new license granted recently for a maximum of 10 years. Previously the maximum was four years and the lengthened period will allow better long-term planning. The company is now drilling its third test well, but so far it has not found signs of commercial oil.

KUWAIT—F. J. Stephens, a managing director of the Royal Dutch-Shell Group of companies, signs the agreement which grants exploration and production rights to Shell over an area of approximately 1,500 square miles of the Persian Gulf off the coast of Kuwait.

The Emir of Kuwait, who is sitting behind his desk, signed the 45-year agreement on behalf of his Government. The ceremony took place in his palace on January 15.

A party of Shell men are now in Kuwait preparing for the exploration surveys which will take place this year. It is expected that the first exploration well will be started by early 1962.



Grove G-4 pipeline valves do not rely on sealing compounds for a bubble-tight seal. Consequently, all cost relative to maintenance is completely eliminated. You get two proven sealing systems only in G-4 valves. First, a positive metal-to-metal seal from the action of the Grove non-wedging gate against precision inner metal seat rings. Backing up the metal-to-metal contact is the proven Grove Seal-"O"-Ring® design. Protected nitrile rubber o-rings are held firmly against the gate, squeegee it smooth and clean for fast, easy open and close. Positive metal-to-metal contact plus bubble-tight o-ring seals mean no sealing compounds, no maintenance costs. For dependable, proven pipeline service, investigate Grove series G-4 pipeline valves.

GROVE PIPELINE VALVES

GROVE FRANCE S. A., 24 Rue de Penthievre, Paris 8e

GROVE VALVE AND REGULATOR COMPANY

a subsidiary of Walworth

OAKLAND 8, CALIFORNIA, U.S.A.

Western Continental European Sales Representative (except Italy)
Pétrochimie, 77 Rue la Boétie, Paris 8e

Licencees: Nuovo Pignone, Casella Postale 487, Firenze, Italy
Robert Cort & Son, Ltd., Reading, England

7125

KUWAIT—Chairman of the new Kuwait National Petroleum Co. (owned 60% by the government, 40% by private Kuwait citizens) is Ahmed Sayid Omar, one of the six directors representing the government on the board. Omar is deputy of Kuwait's finance department and head of its oil office. Another on the board with an oil background is Ashraf Lutfi, an official of the Ruler of Kuwait's secretariat.

KUWAIT—Kuwait Oil Co. (jointly owned by Gulf Oil Corp. and British Petroleum) will spend nearly $30 million during 1961. Of this, $8.4 million will go for 39 development wells; $5.6 million for oil-handling and export facilities; $5.6 million for new construction. Drilling by Kuwait Oil during 1961 calls for continuous operation of five to six rigs; 30 wells in Burgan field, three in Minagish, and six in the Raudhatain-Sabriya area.

KUWAIT—Crude oil production by the Kuwait Oil Co. came to 594,278,196 total bbl last year, a gain of 17.7% over the 505 million bbls in 1959. Exports were 527,299,491 bbl. United Kingdom took 155,990,262 bbl, followed by Japan with 70,149,551; Italy with 60,766,555; Netherlands with 51,314,562; France with 51,249,922; and USA with 46,177,770.

LIBYA—According to Mohammed Asseifat, chairman of Libya's Petroleum Commission, his country has no present interest in joining the five-nation OPEC (Organization of Petroleum Exporting Countries). Libya expects to maintain the traditional 50-50 profits split.

LIBYA—Import duties have been removed on imports of equipment by oil companies in Libya for use by them in Libya for exploration, transportation, refining or other oil activity.

The waiver applies to a list of 18 specific goods, including drilling machines and parts, engines and parts, furnaces and parts, equipment for road-surfacing, hoisting, fire-fighting, liquid pumping, storing, extracting oil from wells, refining the oil, electric generators and engines, poles, cables and pipes, tractors, special purpose vehicles, vessels and general structures, harbor construction equipment, aeroplane hangars, photo and geological survey machines and equipment, machine and hand tools.

SANTA FE DRILLING COMPANY

WORLD-WIDE DRILLING CONTRACTORS

SANTA FE DRILLING

SANTA FE DRILLING COMPANY

P. O. BOX 310, WHITTIER, CALIFORNIA

CABLE "SFEDRLCO"

TELEPHONE OXbow 6-1175

Santa Fe Drilling operations in the Interior of Pakistan.

LIBYA—British Petroleum Co. obtained the right to buy a 50% interest in the Hunt International 12,738-square-mile Libyan Block 65 in Zone III, southern Cyrenaica, after having spudded the first of six tests it had promised the Libyan government it would drill on the acreage to earn this right. The Libyan Petroleum Commission has also announced that government approval followed when BP agreed to surrender the depletion allowance for its own 50% interest.

LIBYA—After abandonment of its first wildcat on Block 39, along the Mediterranean coast in eastern Libya, Shell stacked one of its Libyan rigs in Tripoli. Shell has two other rigs working in Libya, both in the Benghazi area.

MOROCCO—To make exploratory studies in northern Morocco, Pan American International has been awarded a six-month permit covering about 2,700 square miles from Tangier to El Kaar and El Kbir. The Moroccan mining research agency is also looking for a partner to explore the 6,700-square-mile Draa River valley concession which adjoins the Italian ENI's Tarfaya tract in the south.

NEUTRAL ZONE—Arabian Oil Co. of Japan has announced its 10th large oil well in the Persian Gulf offshore the Saudi Arab-Kuwait Netural Zone. Potential of the well is said to be 8,400 b/d.

PAKISTAN—Pakistani minister of fuel Zulfiqar Ali Bhuttom said his country expects within several months to wind up an agreement whereby the Russion government will lend Pakistan technical assistance for oil finding.

PORTUGAL—The Portuguese oil company SACOR (owned one-third by the Portuguese government and partly by Cie. Francaise de Petroles) will sell $10 million in bonds in five European countries. Buyers will be able to pay for their bonds in any one of six currencies and collect their coupons in any one of 17 European currencies. In effect, the investor is assured of getting paid in the strongest currency available at any time.

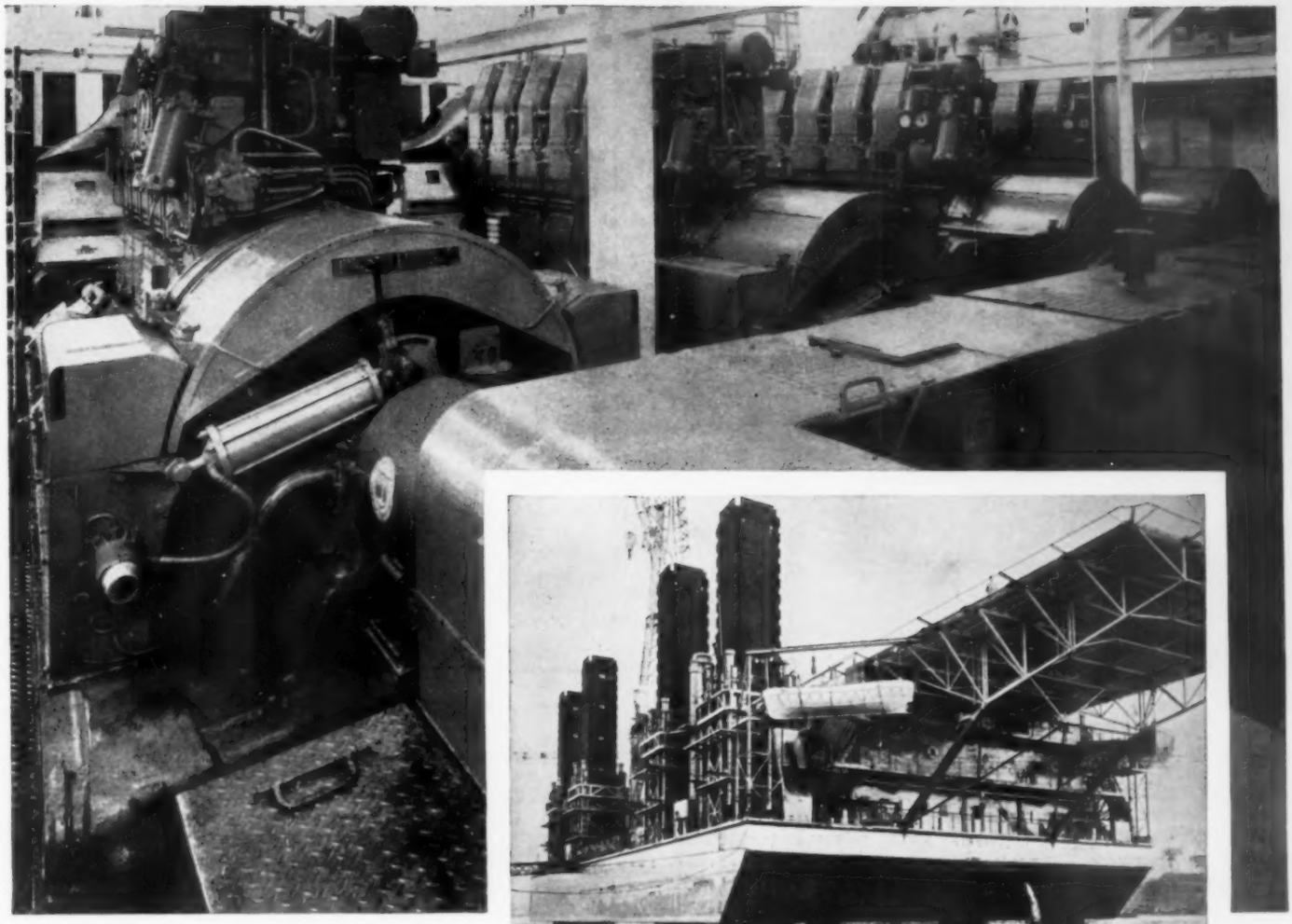
ROMANIA—Romanian gas production in 1960 increased by 15.9% to 236,577 million cubic ft, from 204,162 million in 1959. During 1960, six new chemical plants and 18 chemical and oil-processing plants were put in operation—with the country's first catalytic cracker (5,000 b/d) commissioned at Onesti refinery. Compared with 1959, output in 1960 of gasoline increased by 110,000 tons to 2.8 million tons; gas oil, by 100,000 tons to 2.3 million tons. During 1961, a catalytic reformer and a gas-fractionating plant will go into operation at Brazil refinery; a coking unit at Borzesti refinery—with construction to start on a gas-processing plant at Craiova.

SAUDI ARABIA—King Saud has raised the Department of Petroleum and Mining Affairs to ministry status. Abdullah Tariki, formerly oil director of the department, has been named Saudi Arabia's first Oil Minister.

SAUDI ARABIA—Aramco's $2.8 million construction program to raise the export production capacity of its 27-gravity Safaniya field is expected to boost this capacity to 240,000 b/d by July of 1961 from current 215,000 b/d. Output of the field was raised to over 100,000 b/d in 1960 from average 76,000 b/d in 1959.

SOMALIA—Sinclair Somal has encountered oil shows in its No. 1 Cariole, 50 miles west of Mogadiscia (not commercial). The well is being deepened. This is the sixth test on a 42-million-acre concession in which the company holds 50%.

SOMALIA—Sinclair Somal Corp. announced in February that it had encountered oil in its well, Cariole No. 1, in Somalia, but not in commercial quantities. It is contemplated that additional tests may be made, but meanwhile deepening of the well has



Diesel power for "SEASHELL"

OIL DRILLING IN THE PERSIAN GULF

The main power needs of 'SEASHELL', a mobile oil-drilling platform barge of Bataafsche International Petroleum Maatschappij operating in Doha Bay, Qatar, are provided by six 'ENGLISH ELECTRIC' diesel engines.

The four illustrated are six-cylinder pressure charged, charge-cooled engines, with a continuous site rating of 795 b.h.p. at 900 r.p.m. Two of these engines drive the draw-works and rotary table through 'ENGLISH ELECTRIC' 500 kW generators and 650 h.p. motors. Surplus power can be used by means of splined clutches to supplement the power of the other two engines driving the slush pumps.

Another two engines developing 470 b.h.p. at 900 r.p.m. are coupled to 326 kW alternators providing the normal power supply of the barge itself.

'ENGLISH ELECTRIC'

diesel engines

THE ENGLISH ELECTRIC COMPANY LIMITED, ENGLISH ELECTRIC HOUSE, STRAND, LONDON, W.C.2

DE103

Offices and representatives throughout the world

(*Continued from page 76*)

been resumed. Cariole No. 1 is located approximately 50 miles west of Mogadiscio and 30 miles inland from the Indian Ocean. Sinclair Somal is a subsidiary of Sinclair Oil Corp. and is operator with a 50% interest in a 42,000,000-acre concession. The other 50% interest is divided equally among Continental Oil Co., Amerada Petroleum Co. and Ohio Oil Co.

TAIWAN—Crude oil imports into Taiwan came to 1,060,000 long tons in 1960, and plans for 1961 are for imports at about the same level, the Chinese Petroleum Corp. reports.

TUNISIA—Eleven tankers loaded up in September 1960 at La Skhira, the port terminal of the new pipe line from Edjele, and 20 tankers loaded in November. The quantities were 316,230 and 483,000 tons respectively. By May, 1961, plans are for 750,000 to 800,000 tons a month, and in all of 1961, plans call for exports of 9,000,000 tons.

TURKEY—Gulf Oil Corp., which has been conducting Turkish oil explorations on its own without success, has acquired a 75% interest in three tracts totaling 370,000 acres owned by the West German firm Deutsche Erdoel AG in eastern Turkey. If oil is found, DEA may retain the remaining 25% or transfer it to Gulf against current payments.

UAR (Egypt)—Both the Egyptian State-owned General Petroleum Co. and COPE (part government—and part privately-owned) are preparing for early drilling in the Gulf of Suez. General, which holds 63 permits on both shores of the gulf, will double its capital to $17.3 million.

UAR (Egypt)—During 1961, Caltex and the Italian State agency ENI each will take about 400,000 tons of Egypt's 22-gravity Delayim crude. Offsetting these exports will be imports into Egypt of 2¾ million tons of crude—1¼ million tons of Arabian crude by Caltex and 1½ million of Soviet crude from the Black Sea.

UAR (Egypt)—Imports of crude oil and products during 1960 came to about 1.9 million metric tons, just over half of it crude oil it is reported. The flow seems to be low, about 600,000 tons below 1959, due to greater use of Belayim crude and a cut in exports of Belayim crude. Saudi Arabia supplied some 458,156 tons of the crude imports in the first nine months. Soviet Russia supplied 298,860 tons, for a total of 757,016.

The Soviets were the largest single suppliers of Egyptian imports of gasoline (3,531 tons out of 6,053 tons) in the first nine months; of kerosine (217,724 tons out of 319,360), of mazout (124,948 tons out of 204,457), of diesel oil (17,897 tons out of 23,546), and of solar (83,427 tons out of 102,156). United States led in lube oil shipments (26,259 tons out of 30,981) and in butagaz (30 tons out of 82 tons), while China led in asphalt shipments (64 tons out of 68).

UAR (Syria)—Three 13,000-ft Russian rigs will be used by the General Petroleum Authority for drilling in the Karachok field of northeastern Syria. The rigs were delivered under a Russian-Syrian economic pact. A sixth producer has been reported in the field (4,000 b/d).

USSR—A large discovery has been reported near the town of Tsiteli-Tskaro in Georgia, near the Azerbaijan border. With pay at 3,480 ft, the well is said to be flowing several times the total of 200 small existing producers in the republic.

USSR—Soviet oil production increases steadily, with rising exports. Crude production, now at the 2.8 million b/d mark, is slated to hit 3.1 million in 1961—and if it does, the year will end with the Soviet oil industry having produced 60 million barrels more than called for in the first three years of the present seven-year plan. Gas production rises even faster, at an apparent rate of 30% to 35% per year to help petroleum replace coal as the dominant fuel in the Soviet economy. From one trillion cubic feet in 1958, gas production is programmed to reach 5.3 trillion cubic feet in 1965. Coal output is being held relatively stable. Electric-power generation is leaping ahead—having reached 294 billion kilowatt-hours during 1960, a big increase from 233 billion in 1958.

STOP DISASTER

(*Continued from page 49*)

tions, with F. W. Scheineman of American Oil as chairman, concerns itself with the process-safety problems in actual operation of refinery units. The education of operating personnel in process-safety principles is one of the chief areas of this subcommittee's work.

(3) The Subcommittee on Storage and Handling, with G. C. Caine of Tidewater Oil Co. as chairman, concerns itself with both the design and the operational safety problems associated with shipping, storage, and blending facilities in refineries.

We see no present need—and expect no future one—for lines of sharp separation within the general assignments of the subcommittees. By present indications, there will be enough work for all, and specific assignments can be made by the committee if necessary.

Our fourth subcommittee—the Subcommittee of Engineering Contractors, with A. G. Petkus of Procon as chairman—works with each of the other subcommittees and is also considering operating problems of special interest to its own members.

Operation: The basic task we are undertaking is that of improving communications on matters of process safety. When the committee receives information, it must try to see to it that this information benefits all those in the industry who are concerned with the problem.

Two main communication channels are presently available to us.

One consists of regularly sponsored technical sessions at the Refining Division's mid-year meetings like those held for demonstration purposes before OPC's formation. These sessions are open to the public, and the papers presented at them are published in the API Proceedings and frequently in trade and technical journals as well.

A session devoted entirely to discussions of the occurrence and mechanism of detonations was held at the November, 1959, API meeting. This was followed in May, 1960, with a session on safe startup and shutdown procedures for operating units. Then last November, the OPC co-sponsored, along with three other API committees, a session that featured the Ethyl Corp.'s new movie "Danger! Air!" and included papers on the risk-analysis approach to process safety and on American Oil's process-safety program.

Plans are well along for the session to be held May 10 at the mid-year meeting in Houston. This session, being developed by J. J. Coates, Esso Standard, Division of Humble Oil and Refining Co., will feature papers on intra-company organization to promote process safety and on the safe operation of spheres and flares.

Our second main avenue of communication is through the committee members themselves. These men must see to it that the information they get from the committee is distributed within their own companies.

The committee meetings, in keeping with API policy, are open to employees of oil-refining companies, and such visitors are more than welcome. We hope, in fact, that companies having refineries near the meeting location will encourage their operating and technical people to attend both the committee meetings and the API sessions.

One communication accomplishment of the committee so far has been the encouragement of an interchange of process-safety training material among the participating companies. Thousands of copies of American Oil's series of process-safety booklets (four are now in print; at least one more will be available this spring) have been furnished at cost to other oil companies. Documentary and training films have been exchanged, along with sets of slides used in process-safety training.

OPC recognizes the need for close cooperation with other organizations within the API. In particular, liaison representatives have been appointed to help coordinate OPC's work with the work of the Committee on Refinery Equipment and the Central Committees on Fire Protection and Accident Prevention.

Future Plans: Everyone associated with the formation of this new group has been pleased by the enthusiastic response of the membership to the committee's objectives. Undoubtedly some of our procedures will change with experience; undoubtedly we will develop new methods of increasing the committee's effectiveness. Over-all, however, the growing pains have been few, and the committee is definitely a bustling business even now.

A general outline of subjects the committee presently intends to explore is shown in Fig. 2. These lists are not complete and are intended only to indicate the general division of work among the subcommittees. It is already evident, however, that the committee faces a problem of setting priorities for the order in which these subjects are to be considered rather than a problem of trying to find projects to keep it profitably busy.

We work with a basic premise: Preventing even one major processing accident can easily justify the relatively small expense of participation in this committee's work for all the members for many years. END

Frederic R. Harris Inc.

Consulting Engineers
144 East 44th Street
New York 17, N. Y.

Engineering for the Petroleum Industry

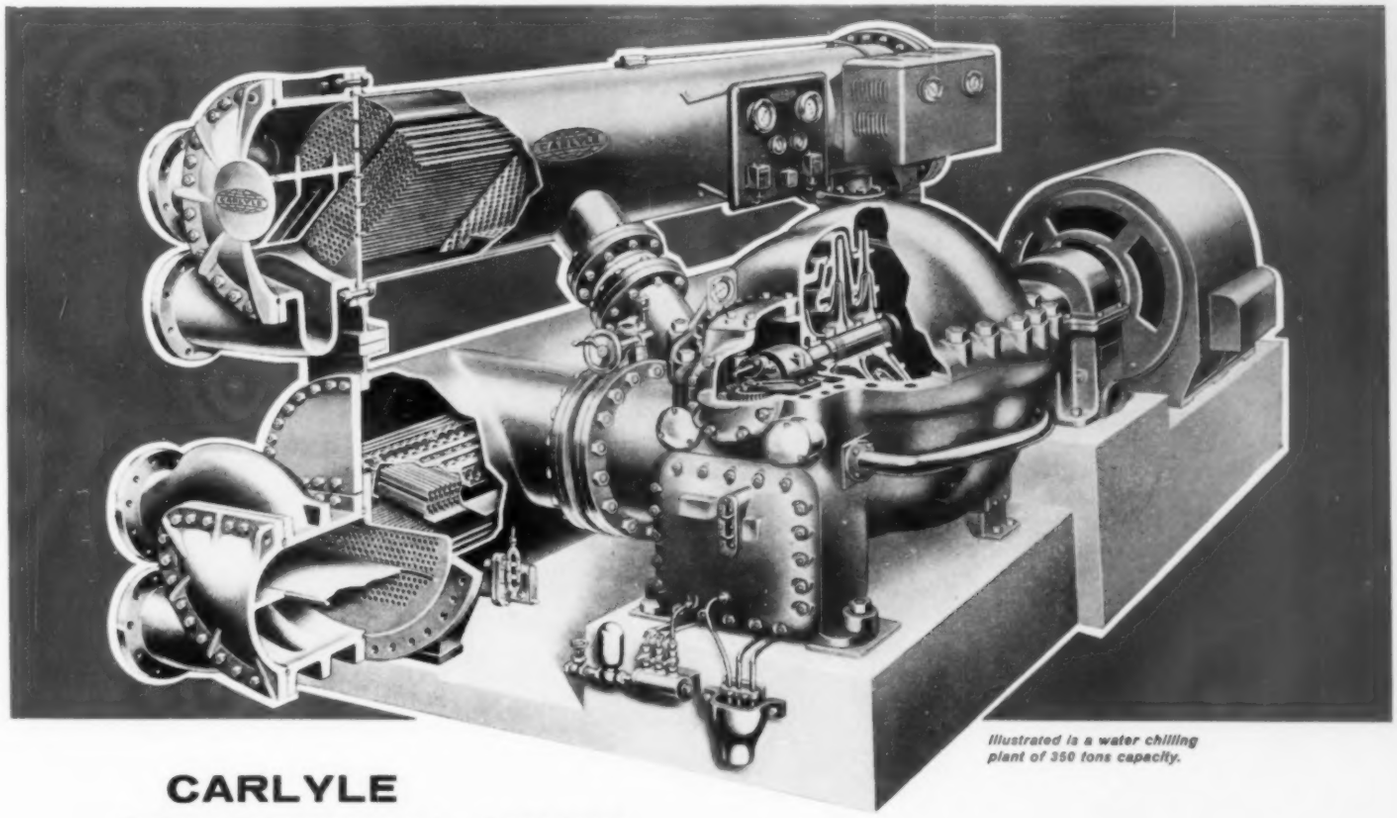
Construction Management
Studies, Design, Operation

Frederic R. Harris (Holland) N.V.

5 Korte Vijverberg
The Hague, Netherlands

CENTRIFUGAL REFRIGERATING UNITS

The answer to exothermic heat exchange and air conditioning problems



Illustrated is a water chilling plant of 350 tons capacity.

CARLYLE CENTRIFUGAL UNITS

Will give long, efficient service with only minimum maintenance and will supply chilled water for all types of air conditioning systems, chill water or brine or condense vapours over a wide range of temperature levels. Give precise, automatic control of chilled water at desired levels.

These compact machines include a multi-stage centrifugal compressor with matching condenser and water chiller, driven by either electric motor, steam or gas turbine. Capacity may be varied economically over a wide range with the machine operating at high sustained efficiency. Refrigeration capacities of 100 to 4,000 tons can be obtained from a single unit.

The high volume of Freon 11 is very important on air conditioning applications where the design evaporator temperature calls for low refrigerant gas volume per ton of refrigeration. The adiabatic head with Freon 11 compares very favourably with Freon 12. The BHP per ton of refrigeration with Freon 11 holds a slight advantage over Freon 12 under identical conditions of operation. However, when the refrigeration tonnages are large and/or the design evaporator temperatures have to be maintained at a low level, the high refrigerant gas volume required for Freon 11 may make Freon 12 the more suitable refrigerant for such applications. Carlyle units are suitable for both refrigerants 11 and 12.

CARLYLE CENTRIFUGALS *are used for a wide range of applications in many fields:*

Chemical Processes, Pharmaceuticals, Beverages, Petroleum, Textiles, Synthetic Fibres, Precision Manufacturing, Food Processing, Meat Refrigeration, Laboratories, Rubber Production, Office Buildings, Hospitals, Hotels.

CARLYLE

Further particulars and literature can be obtained from:

CARLYLE AIR CONDITIONING & REFRIGERATION LTD.,

1 KING STREET, ST. JAMES'S, LONDON, SW1 · Telephone: WHitehall 5356 · Telegrams: CARLBRIT PICCY

World Petroleum Statistics

FREE WORLD SUPPLY AND DEMAND, CRUDE AND PRODUCTS, JULY 1960

(Thousands of barrels)

Source: USA Bureau of Mines, Division of Petroleum

Country	CRUDE PETROLEUM					REFINED PRODUCTS			
	Production	Imports	Exports and reexports	Stock change, other demand, and loss	Total 1/ refinery input / Total 2/ refinery output	Imports	Exports and reexports	Domestic demand (incl. bunkers) 3/	Bunkers-all flags (as reported)
NORTH AMERICA									
Canada	15,826	10,282	3,082	-650	23,874	3,088	301	4/22,742	
Mexico	8,262	-	105	-183	8,979	555	346	9,188	
United States (incl. Alaska and Hawaii)	208,161	32,730	436	-3,318	256,699	23,483	7,155	4/280,600	6,638
Subtotal	232,249	43,012	3,623	-4,151	289,552	27,126	7,802	312,530	
CENTRAL AMERICA AND CARIBBEAN									
Costa Rica	-	-	-	-	-	E/ 98	-	98	
Cuba	6	E/2,350	-	+6	E/2,350	E/290	-	2,642	
Dominican Republic	-	-	-	-	-	E/217	-	217	
El Salvador	-	-	-	-	-	E/123	-	123	
Guatemala	-	-	-	-	-	E/274	-	274	
Haiti	-	-	-	-	-	E/ 76	-	76	
Jamaica	-	-	-	-	-	556	-	556	
Nicaragua	-	-	-	-	-	E/127	-	127	
Panama, Canal Zone	-	-	-	-	-	607	158	449	432
Panama, Republic	-	-	-	-	-	E/214	-	214	
Puerto Rico	-	3,827	-	+1,245	2,780	454	1,655	1,579	
Subtotal	6	6,177	-	+1,251	5,130	3,038	1,813	6,355	
SOUTH AMERICA									
Argentina	4,842	2,187	-	-47	7,076	1,985	-	4/7,877	137
Bolivia	293	-	76	+16	201	8	-	209	
Brazil	2,171	3,796	256	-272	5,983	E/2,250	-	8,233	
British Guiana	-	-	-	-	-	106	-	106	
Chile	573	378	-	+24	927	413	-	1,340	
Colombia	4,712	-	2,265	+556	2,026	63	492	4/1,566	E/115
Ecuador	218	E/103	-	+33	288	20	-	308	
Netherlands Antilles	-	22,305	109	+1,304	23,123	1,607	19,626	5/5,104	
Paraguay	-	-	-	-	-	E/ 61	-	61	
Peru	1,594	-	188	+4	1,402	570	138	1,834	15
Trinidad	3,609	1,489	434	-2,245	6,948	E/105	E/5,463	5/1,352	E/1,094
Uruguay	-	693	-	-149	842	56	-	898	E/ 78
Venezuela	86,643	-	E/63,049	-	23,760	13	E/20,793	4/4,258	E/1,591
Subtotal	104,655	30,951	66,377	-776	72,576	7,257	46,512	33,146	
WESTERN EUROPE									
Austria	1,398	289	580	-109	1,265	607	78	4/1,606	
Belgium and Luxembourg	-	4,005	-	-819	4,864	1,768	2,163	4,469	357
Denmark	-	-	-	-25	25	3,235	12	3,248	168
Finland	-	207	-	-441	E/650	952	-	1,602	
France	1,187	17,660	-	-451	19,314	1,133	4,389	4/15,518	937
Germany, West	3,283	13,193	-	+1,081	15,395	3,237	1,368	17,264	377
Greece	-	780	-	+290	490	436	-	926	
Iceland	-	-	-	-	-	142	-	142	
Ireland	-	1,020	-	+95	925	270	59	1,139	
Italy	1,227	16,098	403	-1,496	18,981	626	4,031	4/12,916	1,137
Netherlands	1,074	12,812	-	+3,451	11,161	2,983	6,159	7,905	580
Norway	-	71	-	+6	65	1,727	-	1,792	
Portugal	-	499	-	-295	794	348		1,135	
Spain	-	73	-	-2,367	2,512	275	113	2,674	E/154
Sweden	-	452	-	-1,090	1,542	6,022	71	7,493	E/247
Switzerland	-	-	-	-	-	2,856	4	2,852	
United Kingdom	53	28,791	-	+3,284	25,560	9,438	4,008	4/25,620	1,864
Yugoslavia	525	301	-	+55	771	E/150	E/ 49	872	
Subtotal	8,747	96,245	983	+1,167	104,314	36,145	22,511	109,190	
MIDDLE EAST									
Aden	-	3,121	-	+255	2,866	802	855	2,813	E/2,291
Bahrain	1,351	4,803	-	-37	6,191	25	4,766	1,450	366
Iran	29,258	-	17,952	-464	11,770	-	6,763	5,007	E/453
Iraq	30,032	-	E/28,796	-	E/1,236	E/ 1	-	1,237	
Israel	72	E/828	-	-	900	E/898	E/ 6	1,792	E/ 51
Jordan	-	-	-	-	-	E/118	-	118	
Kuwait	47,866	-	43,812	-1,666	5,720	E/ 2	3,513	2,209	1,695
Lebanon	-	425	-	-	425	E/ 28	-	453	E/ 69
Neutral Zone	3,943	-	1,800	+1,143	E/1,000	-	E/670	330	E/150
Qatar	5,141	-	E/5,123	-	E/ 18	-	-	18	
Saudi Arabia	37,212	-	29,489	+333	7,390	57	4,527	2,080	E/1,060
Turkey	202	-	-	+12	190	771	-	961	
U.A.R., Syria	-	E/423	-	-	E/423	9	-	432	
Subtotal	155,077	9,600	126,972	-424	38,129	2,711	21,100	18,900	
AFRICA									
Algeria	4,595	-	3,655	+940	-	571	-	4/737	
Angola	46	215	-	+143	118	78	1	195	
Republic of the Congo	-	-	-	-	-	E/296	-	296	
Canary Islands	-	2,380	-	+653	2,319	9	1,243	5/1,085	423
Ethiopia	-	-	-	-	-	E/ 57	-	57	
States formerly in French Equatorial Africa	-	-	-	-	-	E/178	-	178	
States formerly in French West Africa	502	-	461	+41	-	E/341	-	341	E/660
Ghana	-	-	-	-	-	E/216	-	216	
Kenya	-	-	-	-	-	E/478	70	408	E/ 76
Liberia	-	-	-	-	-	E/ 32	-	32	E/ 3
Malagasy Republic	-	-	-	-	-	72	-	72	
Morocco	56	95	-	-	151	380	4	4/485	
Nigeria	517	-	480	+37	-	557	-	557	
Federation of Rhodesia and Nyasaland	-	-	-	-	-	E/329	-	329	
Sierra Leone	-	-	-	-	-	E/191	-	191	
The Sudan	-	-	-	-	-	E/127	-	127	
Tanganyika	-	-	-	-	-	63	43	20	
Tunisia	-	-	-	-	-	436	-	4/316	
Uganda	-	-	-	-	-	97	18	79	
Union of South Africa	-	677	-	-91	768	1,505	113	2,160	E/169
U.A.R., Egypt	1,977	E/351	-	-	2,354	E/596	E/123	2,827	E/185
Subtotal	7,713	3,724	4,596	+1,723	5,710	6,609	1,611	10,708	
SOUTH ASIA, FAR EAST, AND OCEANIA									
Australia	-	6,225	-	-445	6,905	1,028	838	4/6,870	E/632
British Borneo	2,847	-	1,527	-	E/1,320	E/ 77	E/1,261	136	77
Burma	322	-	-	+5	E/317	E/ 15	E/ 4	328	
Ceylon	-	-	-	-	-	414	-	414	E/215
India	255	E/3,512	-	+203	E/3,568	E/2,338	E/229	5,657	E/230
Indonesia	12,923	E/981	6,765	+333	E/7,223	E/271	3,290	4,204	236
Japan	296	16,734	-	+348	17,149	3,165	310	20,004	
Korea, South	-	-	-	-	-	379	-	379	
Malaya and Singapore	-	11	-	+11	-	3,875	1,439	2,436	996
Netherlands New Guinea	131	-	E/131	-	-	Insig.	-	Insig.	
New Caledonia	-	-	-	-	-	E/ 34	-	34	
New Zealand	-	-	-	-	-	1,444	-	1,444	
Pakistan	177	-	-	-25	202	E/1,164	E/ 21	1,345	E/130
Philippines	-	1,008	-	+252	756	E/859	-	1,615	E/ 11
Taiwan	1	369	-	-138	508	13	2	519	
Thailand	-	-	-	-	-	E/675	-	675	E/ 22
Vietnam, South (incl. Cambodia)	-	-	-	-	-	E/461	-	461	E/ 3
Subtotal	16,952	28,840	8,423	+560	37,908	16,212	7,394	46,521	
WORLD TOTAL EXCLUDING EASTERN EUROPE, U.S.S.R., & MAINLAND CHINA	525,399	218,549	210,974	-690	553,339	99,098	108,743	537,350	

E/ Estimate based on latest available data.
1/ Total input includes crude runs to stills plus runs of other unfinished oils, topped crude and natural gas liquids blended.
2/ Total output includes refined product output plus refinery fuel and loss; excludes liquefied petroleum gases sold directly for fuel and chemical uses from natural gasoline plants.
3/ Unless otherwise specified, data represent apparent domestic demand (including inland demand, refinery fuel and loss, and bunkers). Apparent domestic demand is derived from the components of refined product output, plus imports, minus exports, with no allowance for changes in stocks.
4/ Domestic demand as reported, including refinery fuel and loss, stock changes, and bunkers; also includes, where available, liquefied petroleum gases sold directly for fuel and chemical uses from natural gasoline plants.
5/ Apparent domestic demand is heavily influenced by refinery fuel and loss, and bunker loadings.

AROMATIC CHEMICALS

(Continued from page 64)

coatings of the water-soluble baking type. It also contributes increased hardness and faster drying properties to air-drying alkyd resins. It may be useful in ester plasticizers, in dyes, in unsaturated polyesters, as a curing agent for epoxy resins, and as a chemical intermediate. A new plant is being built by Scientific Design Co. for this product.

Compared with even two years ago, the current picture of the aromatics chemical industry shows a beehive of activity. Many more changes will be forthcoming. It is an exciting development in a century old industry—a new renascence brought about by a dynamic industry, centered in the USA. Such world leadership is constructive and impressive, a tribute to the petroleum, chemical and engineering companies of the country. END

WEIGHT DROPPING

(Continued from page 47)

where large numbers of drops per kilometer were required to produce a satisfactory record quality. Over the year's time, the individual crew average ranged from 3.84 km/day to a high of 5.82 km/day. One crew had a six month average in a fair to good quality record area of 7.45 km/day or 203.4 km/month.

A typical North African weight dropping crew consists of a party chief, seismologist, computer, and analyzer operator—for the office staff; and an observer, junior observer, weight operator, technical alternate, utility man, surveyor, mechanic, and party manager—for the field staff. In addition, some 45 local laborers perform duties as drivers, cooks, waiters, helpers, and geophone and cable handlers.

Since the operation of any seismic party must be highly mobile for desert operation, all Thumper crew equipment is truck-and-trailer mounted. And because of this, it is not uncommon for a Thumper crew to move thirty kilometers in a day to a new campsite, and still continue with a full day's production without interruption.

Libya is not the only African country using weight dropping crews. For now, Algeria has three; Tunisia one; and the Spanish Sahara two. These crews have added flexibility, speed, and safety to remote desert seismic operations.

A very large contributing factor to the success of weight dropping is the experience of the organization fielding the crews. This experience, coupled with the flexibility of the method, and the versatility of the radio-controlled field equipment, allows rapid changes in field procedure as record quality changes. This assures maximum average record quality at minimum average cost per kilometer. This experience stands behind every one of the more than 28,000 drops per working day being made by the Thumper in domestic and overseas seismic exploration at the present time. Thus the Thumper will drop the weight more than 10,000,000 times in 1961 with all of the accumulative experience of almost eight years of production weight dropping working to produce better quality records at a much lower cost per kilometer. END

Look at It

...each way you save with MISSION PISTONS

Every minute that it's working, the Mission Piston is working for you. Working to cut your pumping costs, working to cut your downtime. Here's why: These bodies are lightweight, one-piece *forgings;* yet they're strong enough to resist extremely high pump pressures. The special fabric backing of the rubber compounds provides just the right degree of reinforcement for maximum piston rubber life.

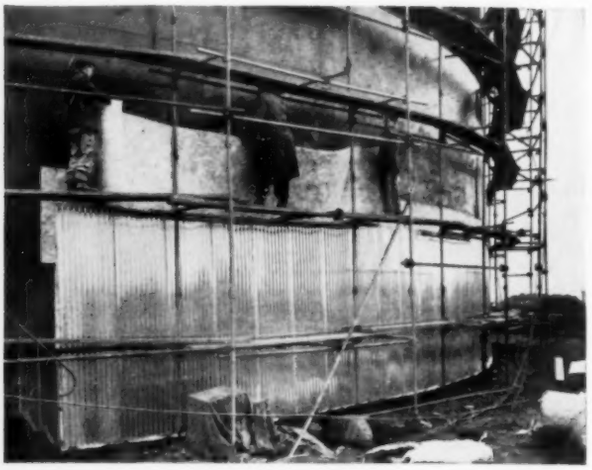
The three long-life piston rubber compounds available are designed for your specific drilling operations to save you the most. Plus, these rubbers are replaceable, saving about half the cost. And you can replace them without removing the piston, saving even more. Mission pistons are the standard, because of Mission engineering, Mission quality control, and the Mission guarantee.

MISSION MANUFACTURING CO. P. O. Box 4209, Houston, Texas • Cable Address "MISSCO"
Export Office: 30 Rockefeller Plaza, New York • In the United Kingdom: MISSION MANUFACTURING CO., LTD., 1 Hanover Square, London W. 1 England • cable address "MISSOMAN"

MISSION MANUFACTURING CO.

If you want the benefit of ESSO's experience of insulating tanks . . .

LOOK AT THESE TWO PICTURES



They show the method of applying Crown insulation used on the tanks in the new Esso installation at Tynemouth.

First Stud-weld a series of pins to the surface of the tank.

Second Impale Fibreglass Crown insulation on these pins. Because of its high tear strength it will be supported by the pins indefinitely and without sagging.

Third Cover with light-gauge corrugated sheet metal impaled on the same pins and secured by caps crimped over the prepared ends of the pins.

This method is not only effective and good looking but inexpensive. It does away with the separate framing otherwise necessary, and holds the insulation securely to the tank itself. You can learn more about the advantages from . . . .

FIBREGLASS
TRADE MARK

FIBREGLASS LIMITED,
ST. HELENS, LANCS.

FIRST in the OIL FIELD

Long experience in meeting the demand for Specialised transport enables us to supply chassis expressly designed to fulfil operators' requirements in carrying capacity and performance over all types of terrain.

There is ample evidence of our success in the large number of Thornycroft vehicles at work in oilfields in all parts of the world.

Shown here:

ABOVE: One of a fleet of "Antar" "Sandmaster 'C'" tractors with special 900 U. S. gallon capacity fuel tank operated by ESSO Standard (Libya) Inc.

TOP LEFT: A "Big Ben", one of 12 built for Halliburton Oil Well Cementing Co., to carry cementing outfits and for other duties in North Africa and Saudi Arabia.

BOTTOM LEFT: One of a fleet of Thornycroft "Big Ben" "Sandmaster" composite trucks for desert use operated by BP Exploration Co. (Libya) Ltd., in North African oil exploration.

The

THORNYCROFT

ORGANISATION

THORNYCROFT HOUSE, SMITH SQUARE, LONDON, S.W.1, ENGLAND

BRANCHES AND AGENTS THROUGHOUT THE WORLD

Niarchos Wins Libel Case

The London newspaper EVENING STANDARD has paid libel damages to Greek shipowner Stavros Nicarhos in addition to apologies and retractions already published. This was the settlement of a lawsuit resulting from newspaper articles criticizing Mr. Niarchos for a contract to carry a limited quantity of Black Sea oil to Europe and Japan and alleging that such contract aided Cuba's Castro. Similar suits against other British and French publications have previously been settled by apologies in court and in the papers. This was the first of these suits in which the payment of damages was not waived.

Ocean Bed Oil Well

A new oil well drilled 8,300 ft. below the ocean floor in 56 ft. of water, 35 miles off the Louisiana coast, has been brought into production by remote control from the surface of the sea without the use of divers.

The well has been drilled by Shell Oil Co., the largest offshore producer in the Gulf of Mexico. The new technique, the result of several years' work by the Exploration and Production Research Division of Shell Development Co. at Houston, Texas, makes it possible to place the equipment necessary for controlling the flow of crude oil and gas on the bottom of the sea over the completed well. Operations involved in bringing in the well, and subsequent production operations, are all carried out by remote control from the surface of the water.

Research Developments in Germany

Research activities of the German firm of Chemische Werke Huels A.G. in the field of Ziegler chemistry (high polymer synthesis with organo-metallic catalysts) have led to new and encouraging results. Systematic tests and commercial scale production have enabled Huel to add to its range of petrochemicals a number of new and promising plastics and synthetic rubber products. These products are among the significant developments of the last decade and may also influence the growth of chemicals, thermoplasts (plastics), and elastomers (synthetic rubbers) in a commercial sense.

Automotive and Reactor Industries: Vestolen A (high-density polyethylene) and Vestolen P (isotactic polypropylene) are already produced on a large scale (6,000 and 3,600 tons per year respectively). Because of its good neutron absorption capacity, Vestolen has recently been mentioned in connection with reactors, atom-powered ships as well as airplanes. But also the automotive industry will be more interested in this material for the manufacture of steering wheels, hub caps and heat resisting tube connections close to the engine. Ziegler catalysts furthermore enabled Huels to develop isotactic polystyrene, the melting point of which is far above that of the polystyrene types known so far, thus opening up new fields of application for this material.

Polyamide 12: An extremly promising development at Huels is the manufacture of dodecanol lactam, from which Polyamide 12 may be produced. Polyamide 12 (Perlon corresponding to Polyamide 6; Rilsan corresponding to Polyamide 11) appears to be an interesting raw material for fibers, gear wheels and similiar technical items, which in many cases are superior to identical parts made from Perlon and Rilsan.

Sulzer Engine Power Record

In a recent trial run, a Sulzer RD engine of 900 mm bore attained an output of 3,000 h.p. per cylinder. The engine is of normal design in all respects and is sold with a nominal cylinder rating of 2,000 h.p. The output of 3,000 h.p. was reached at a speed of 130 rpm and a mean effective pressure of 10.5 kg/cm$_2$. At this pressure and at an exhaust temperature of 380C stipulated by the purchasers of this 6RD90 unit, the fuel consumption was 155 grams/hp-hr. In the range from 6 to 7.5 kg/cm$_2$ the figure of 150 grams/hp-hr. was never exceeded. On this showing, a twelve-cylinder engine of the same type would be capable of an output of 36,000 in hp.

Conoco Purchase

Continental Oil Co. has offered to purchase the Douglas Oil Co. of California, Los Angeles, one of the leading independent refiners and marketers on the West Coast. Under the proposal, which is subject to approval by Douglas stockholders, Continental would acquire Douglas' assets and business in exchange for shares of Continental stock, according to the statement. Holders of Douglas stock will receive one share of Continental stock for each five shares of Douglas stock.

Present operation of Douglas was organized in 1946. However, the operation of the company through the Krieger family interests dates back to 1930. Douglas operates refineries at Paramount near Los Angeles, and at Bakersfield and Santa Maria, Calif. The units have a combined daily capacity of more than 20,000 barrels. The company markets petroleum products under the "Flying Heart" brand through 270 service station outlets located primarily in California. In addition, it has stations under construction and manufactures and distributes asphaltic products. Douglas will continue to operate under its present management and its own established policies and will retain "Flying Heart" brand name, the statement said. Company offices are located at 816 West Fifth St., Los Angeles.

California Co. in Open Water Test

The first exploratory oil and gas search of Gulf of Mexico open-waters bordering Florida's west coast, north of Charlotte Harbor, has been undertaken by The California Co. pursuant to terms of a $10 million contract between this Standard of California subsidiary and Coastal Petroleum Co., wholly-owned affiliate of Coastal Caribbean Oils, Inc.

Scheduled to probe to a minimum depth of 10,500 ft, the drilling barge for the California-Coastal No. 2 State Lease 224-A is located eight miles off the shores of Franklin County and due south of Tallahassee.

The Supreme Court's submerged land decision earlier in 1960 paved the way for resumption of exploration and drilling by The California Co. on approximately 4,500,000 tideland acres held under lease from the State of Florida by Coastal Petroleum Co. Prior to the federal government's action contesting ownership of Gulf of Mexico tideland areas beyond the three-mile limit, The California Co. had conducted extensive seismic surveys on the coastal property.

Mailing Address

CAMDRILL INTERNATIONAL, INC.

c/o CAMAY DRILLING CO.

4250 WILSHIRE BLVD.

LOS ANGELES 5, CALIF.

Cable Address

Camdrill—Los Angeles, Calif.
Camdrill—Tripoli, Libya
Camdrill—Panama City, RP.
Camdrill—Las Palmas, Canary Islands
Camdrillco—Paris, France
Camdrill—Adana, Turkey

CAMDRILL WITH CONFIDENCE

A Scammell 4 x 4 Mountaineer Oilfield Motive Unit with 25/30 ton semi-trailer transporting drill pipes in Tripoli.

ROAD OR NO ROAD IT'S ALL ONE TO SCAMMELLS

On modern motorways or in the back of beyond . . . over sand, scrub, ice, snow or where conditions are well-nigh impossible, Scammells are at home in any sort of going. They should be—they're built that way. Hand-built too, and designed throughout to do a special job—to your specification if you wish it.

Scarab mechanical horses, automatic-coupling and 5th wheel semi-trailers, 6 & 8-wheel 'artics', oilfield trucks for unitized loads up to 67,200 lb. and tractors for hauling gross train weights of 336,000 lb. — these are just a few of the Scammell range — a range that is specially built for rough jobs in tough places. Get full particulars from your local Scammell dealer or write to us direct.

SEMI- Scammell TRAILERS

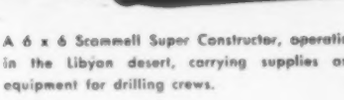
A 6 x 6 Scammell Super Constructor, operating in the Libyan desert, carrying supplies and equipment for drilling crews.

SCAMMELL LORRIES LTD.
Head Office & Works: Watford, Herts, England.
Tel: Watford 25231 & 25691. Telegrams 'Twelftos' Watford.

Scarab Mechanical Horse and semi-trailers for refuse-collection and general haulage purposes.

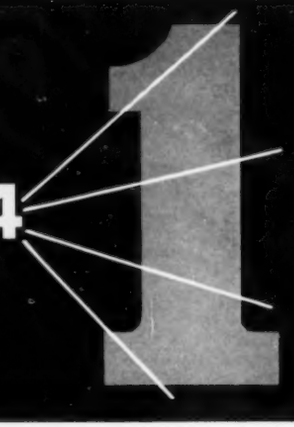
Articulated 8-wheeler

Mountaineer 4 x 2 & 4 x 4 8, 13 & 15 cu. yard dump trucks



30-ton Machinery Transporter

NOW—FOUR GEOPHYSICAL SERVICES AVAILABLE FROM ONE SOURCE

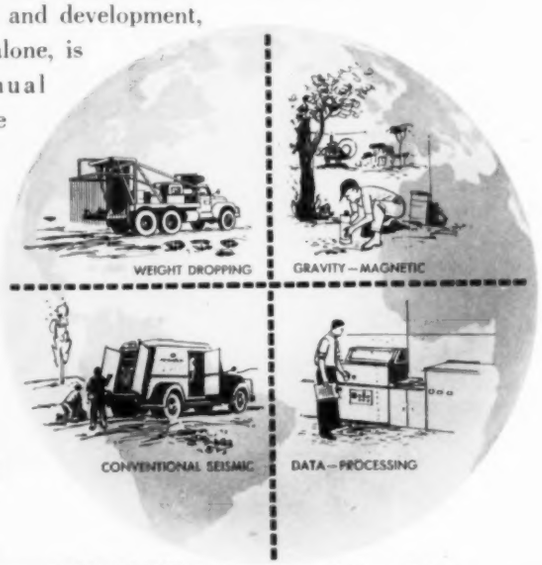


The Robert H. Ray Companies are the first to offer four proven, subsurface, data-gathering methods. These services are available now — anywhere in the world.

To provide you the finest in Gravity, Magnetic and Seismic services, including Geograph, the Robert H. Ray Companies employ teams of highly trained technicians, experienced field crews, and the finest precision instruments and equipment.

More than twenty years of continuous operations in domestic and foreign areas give you the benefit of worldwide experience. Intensive research and development, eighteen years on Geograph alone, is your assurance of continual progress, new and progressive concepts in geophysical techniques. These advantages are put to work for you with each Robert H. Ray Companies contract.

Let us explain how the four services of the Robert H. Ray Companies can fit into your geophysical program.



For Geograph in Europe and the French Zone contact GEOGRAFRANCE, 48 Blvd. de Latour-Maubourg, Paris 7e.

ROBERT H. RAY GEOPHYSICAL COMPANIES

2500 Bolsover, Houston 5, Texas

REFRACTORY & INSULATING CONCRETES

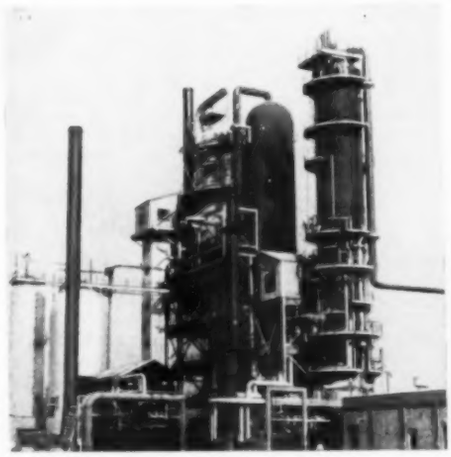
(REFRACTORY CASTABLES)

For the

OIL INDUSTRY

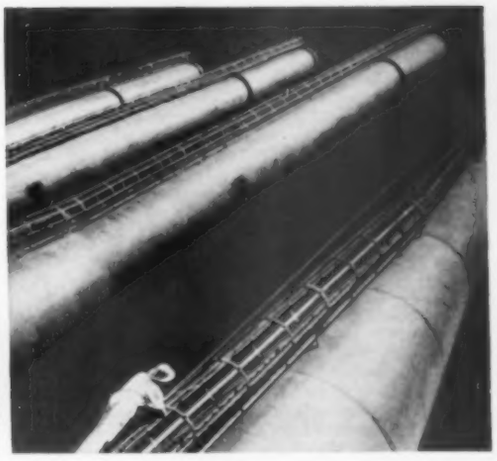
made with CIMENT FONDU
Regd Trade Mark
ALUMINOUS CEMENT

can be "gunned" or cast-in-place, and depending on the aggregates used can have any fired density between 30-120 lbs. per cu. ft.



Montreal refinery. Regenerator towers gunited

Kwinana refinery. Towers gunited



Aden refinery. Reactor and chimney stack linings

and NOW ! SECAR 250

Secar 250 refractory castables have all the advantages of Fondu castables PLUS high purity and high refractoriness.

SECAR 250

a super-purity white calcium-aluminate cement with IRON COMPOUNDS AND SILICA LESS THAN 1% suitable for IRON-FREE REACTOR LININGS, SUPER-DUTY CASTABLES, and the HIGHER TEMPERATURE APPLICATIONS.

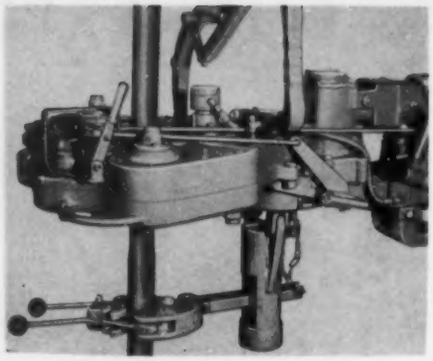
WRITE FOR LITERATURE ON:

1. Super Duty Refractory Concretes made with Secar 250.
2. Refractory Concrete made with Ciment Fondu.
3. List of British Castable Manufacturers and Special Aggregate Suppliers.
4. Heat Insulation with Insulating Concrete.
5. High-Alumina cement in oil-refineries.

AVAILABLE THROUGHOUT THE WORLD

LAFARGE ALUMINOUS CEMENT COMPANY LIMITED, 73 BROOK STREET, LONDON, ENGLAND

Ciment Fondu Lafarge Corporation, 122 East 42nd St. New York 17, N. Y. Ciment Fondu Lafarge (Canada) Ltd., 150 Beaubien St. West. Montreal, P.Q.



Power Tubing Tong Back-up

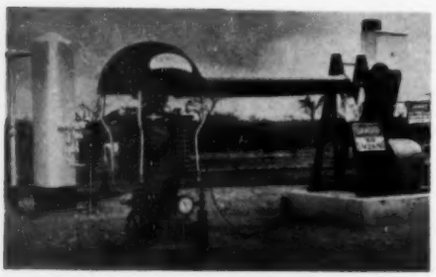
A new, semi-automatic back-up attachment for BJ power tubing tongs has been introduced by Byron Jackson Tools, Inc. It prevents the lower section of the tubing string from turning in the slips while a stand is being made up or broken out and eliminates the separate manual back-up tong and hanging line formerly required with power-operated tubing tongs. An extra man is not required to handle the back-up tong. It also increases crew safety and speeds the running of tubing into or out of the hole.

Muller Returns to States

Baroid Division National Lead Co. has announced the return of Ben T. Muller from a third tour in Papua, New Guinea, and New Zealand with Australasian Petroleum Co., and his assignment to the Lower Texas Gulf Coast Area in Houston, Texas. Mr. Muller worked as a service engineer out of Houston for several years before this present assignment, and also served a tour in Trinidad, British West Indies.

Parsons Expansion

The Ralph M. Parsons Co., engineers-contractors, Los Angeles, has expanded its services to the petroleum industry to include automated production and transmission systems. Sturgis L. Stentz is manager of the petroleum automation department. Stentz, whose background includes over 20 years in design and installation of petroleum production facilities was responsible for the development of the "Single Tank System" of lease production.



Sonic Pumps

Johnston Testers, Inc. is establishing a Texas network of sonic pump sales and service locations in areas where down hole well conditions are particularly troublesome. Abilene, Corpus Christi, Houston, Odessa, Pampa and Wichita Falls are included.

The sonic pump has undergone intensive evaluation tests over the past year by eight major oil companies, with each company submitting a written engineering report to Johnston on performance. The evaluation tests showed that, in gaining full effectiveness of the sonic pump, new tubing or inspected tubing in first class condition must be used. The pump was found most effective when used with API J-55 upset tubing and Johnston engineers recommended tubing depths of 4,000 ft or less.

The tubing is suspended free in the hole and is vibrated between 600 and 1,200 strokes per minute. Pump stroke ranges from 2/10 to ½ inch. Fluid is impelled upward on the up stroke of the pump, at a force from five to ten times that of gravity. The tubing-to-casing centralizers prevent lateral vibration of the tubing string.

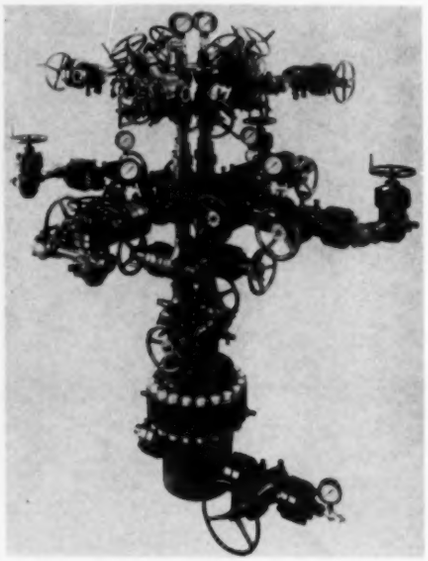
Lummus Expands Engineering

The Lummus Co. has expanded its Engineering Development Center at Newark, N. J., to pace the company's growth into new areas of scientific activity, President James F. Thornton has announced.

"The prime objective of this broadened development program is to better serve the growing diversification of manufacturing needs of our clients," Thornton said. "We want to expand our Engineering Development Center into new areas in which we may utilize the results of basic research done by universities, foundations and our clients, and carry these results through engineering and pilot development to full scale commercial installations."

Director of the new Center is Dr. Souren Z. Avedikian, who joined Lummus a year ago after 25 years in consulting and staff research and development work, and manager is Ward J. Bloomer, with Lummus 30 years.

Dr. Sidney B. Tuwiner is manager, chemical and metallurgical department; Dr. Hoke S. Miller is manager, radiochemical and electrochemical department; Stephen M. Karwan is manager of the petroleum, petrochemical and coal department; and Thomas M. Bennett is manager, pilot plant construction department.



Eight-String Christmas Tree

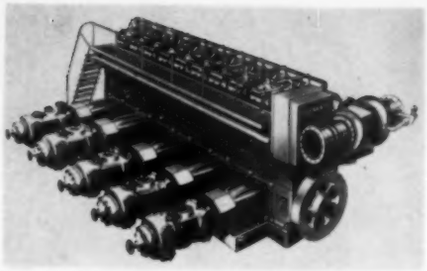
The oil industry's first eight-string well-head assembly was completed and shipped recently by Oil Center Tool Co., Houston. Designed around standard O-C-T components, used previously for multiple completions in as many as six zones, the assembly will support four strings of 2½-in tubing, each containing a string of 1½-in tubing.

New Centrifugal Pumps

A new line of single-stage centrifugal pumps announced by Goulds Pumps, Inc. provides the optimum in interchangeability of pumps and parts, and is designed especially for chemical processing, petrochemical and petroleum refining industries but equally adaptable for use in any industry that must handle chemicals—corrosive or abrasive—cold or hot (—350 to 500 F)—clear liquid or slurries. The eleven sizes in the line provides capacities up to 775 gpm and heads up to 300 ft. Pumps are stocked in three standard constructions; Ductile Iron, 316 Stainless Steel and Gould-A-Loy 20, but are also available in any machinable alloy to meet special requirements. New 16-page Bulletin No. 725.8 with detailed data available on request to Goulds Pumps, Inc., 220 Black Brook R., Seneca Falls, N. Y.

New Pump Unit Design

Headlined as "a bold, new concept in pumping unit design" — integrated truss-construction — Bethlehem Steel's new Series "60" pumping unit is fully described and illustrated in a new booklet, No. 1669, now available on request to Bethlehem Steel Co., Supply Division, 21 East Second St., Tulsa, Okla.



TLA Angle Compressor Modified

Clark Bros. Co., one of the Dresser Industries, has modified its Model TLA Gas-Engine-Driven Compressors for the 1,500—3,000 bhp range. Designated Model TBA, the new unit with 17 x 17 bore and stroke will supplement the TLA in intermediate horsepower steps. It will be built in five, six, eight and ten power cylinder models rated at 1,500, 1,800, 2,400 and 3,000 bhp respectively. These sizes combined with TLA units rated at 1,700, 2,000, 2,800, and 3,400 bhp, offer a full range of models to meet any pipeline or process requirement.

Gardner-Denver Pumps Improved

New and important features have been added to the 500 hp, 14-in. stroke, mud pump of the Gardner-Denver GX line. A cast steel fluid end has now been adopted as standard equipment complete with threaded valve covers and new threaded cylinder heads. Optional alloy iron cylinders and bolted type valve covers are available. Another added value in the new pump is the counterbalanced eccentric for smoother performance.

Chemetron Names Hinrichs

Lansing M. Hinrichs has been promoted to general manager of Girdler Catalysts, a unit of the Louisville-headquartered Chemical Products Division of Chemetron Corp. Mr. Hinrichs, who joined the company in 1951, was patent counsel for the Girdler Process Equipment Division in Louisville before becoming assistant to Chemical Products Division president Howard D. Hartough in 1959.

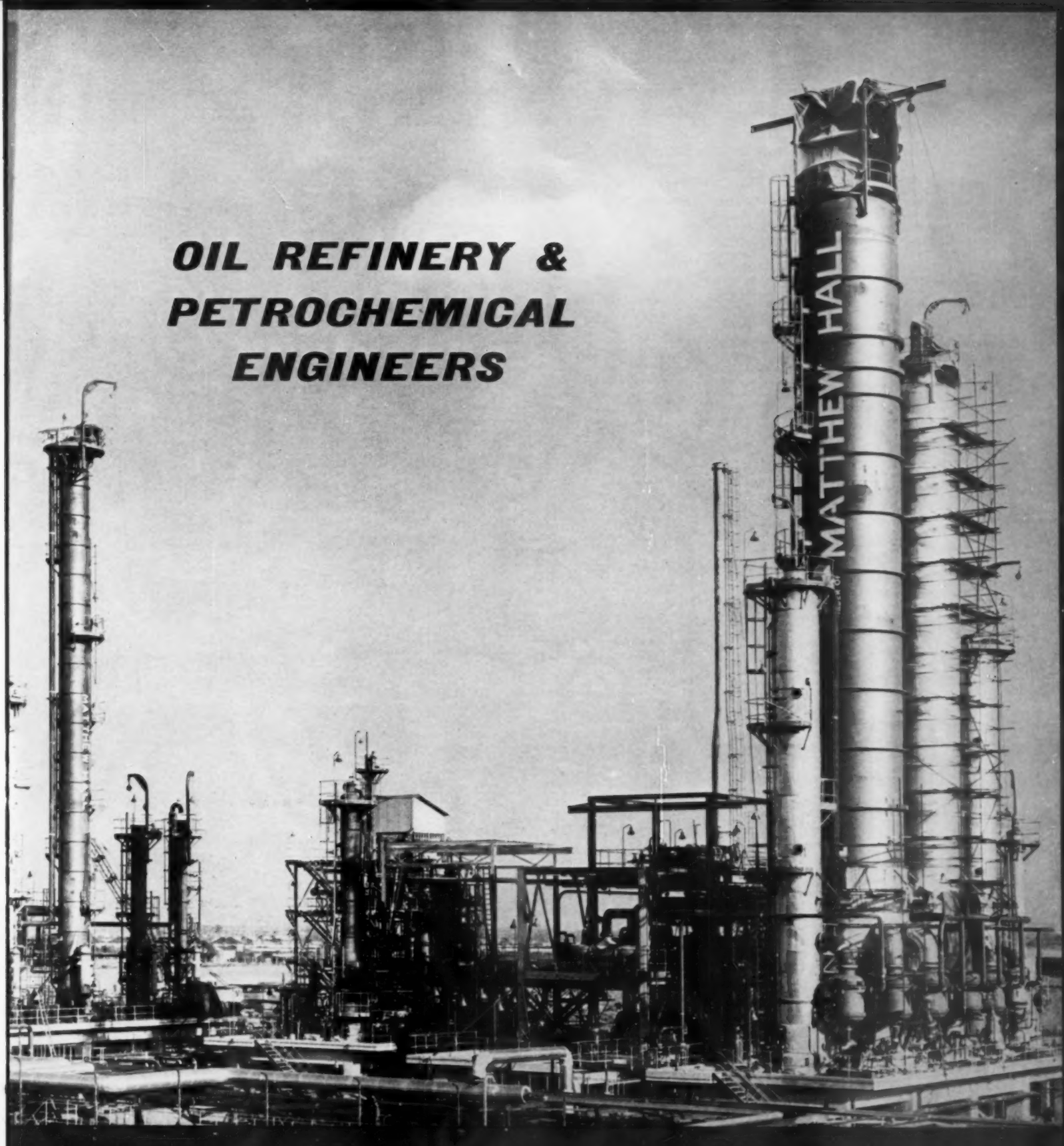
ONE OF NEW YORK'S FINER HOTELS

On the city's most famous thoroughfare, 5th Avenue in exclusive Washington Square. Spacious single rooms from $10 daily. With air-conditioning from $12-$14. Lavish 2 & 3 room apartments with serving pantries. Television available.

SPECIAL RATES on a monthly basis. Additional substantial savings, on unfurnished and furnished apartments on lease.

Write for descriptive brochure
N. Scheinman, Managing Director

Fifth Avenue Hotel
24 FIFTH AVENUE at 9th STREET



OIL REFINERY & PETROCHEMICAL ENGINEERS

MATTHEW HALL

& CO. LTD.

LATIN AMERICAN OIL NEWS

ARGENTINA—Six private oil companies, all formed before 1920, have formed an association, Camara Yacimientos Petroliferos, Empresas Privadas Argentinas. Aim is to make sure of consideration in the government's forthcoming invitation to private firms to help develop YPF producing zones. Recently, about 20 new private companies have come into being, in hopes of obtaining government contracts. Astra S. A. alone among the six members of the new association is producing significant amounts of crude oil. Its 1959 output was 94,300 cubic meters of crude.

ARGENTINA—Cities Service Production Corp. (wholly owned subsidiary of Cities Service Co.) has acquired a half-interest in the Argentine operations of White Eagle International, Tulsa independent. So far White Eagle's operations involve only a waterflood project for Astra Cia., private Argentine producer.

ARGENTINA—Argentina, with 4,175 kilometers of trunk natural gas pipe lines, plans three more large gas pipe line projects. Gas del Estado already has received bids to construct 1,791 kilometers of 30-inch line from the South Flank of the Comodoro Rivadavia to Buenos Aires. The builder is to own and operate the line and Gas del Estado will pay a toll for the gas carried through the line.

A second line from the Campo Duran fields is planned, of 1,200 kilometers of 22-inch to San Lorenzo, passing through Northeast Argentina. Gas del Estado plans distribution networks in nine provinces. Cost is put at $51 million for the line from Campo Duran and $59 million for the distribution systems.

ARGENTINA—To date, Pan American International has completed 250 wells in Argentina—100 more than it had been committed to drill in the first two years of its 1958 agreement with YPF. At present it is delivering about 30,000 b/d of crude to the State agency's marine terminal on the coast.

ARGENTINA—Though still a net importer, Argentina has begun exporting crude in international markets. With her first customer neighboring Uruguay, crude will come from Tierra del Fuego and Comodoro Rivadavia areas. With the deal expected to bring Argentina $10 million (US), Uruguay is understood to have offered $1.74 per bbl for 26-29 gravity and $2.30 for 40-49 gravity crude.

ARGENTINA—Argentina's recently formed National Oil Co. plans a 13,000-ft offshore test in Lake Maracaibo on acreage offsetting Phillips Petroleum's Block 17 and Shell's Block V. Early delivery of a drilling platform is expected.

ARGENTINA—A cut in the tax of three pesos per liter has been made by Argentina as gasoline supply caught up with demand. Result will be a 10% cut in the price including tax to the consumer to 5.40 pesos a liter. The tax supports the national highway fund, and other sources of revenue are eyed to make up the tax loss. Among them are taxes on fuel oil, diesel oil and other oil products.

BOLIVIA—Second stepout from its Caranda oil discovery 35 miles northwest of Santa Cruz will be drilled by Bolivian Gulf Oil. Caranda No. 3 is two miles southwest of No. 1 discovery; No. 2 recently was brought in about ½ mile to the north—no complete evaluation of either as yet.

CHILE—ENAP has started the first wildcat in northern Chile, in the Salar Pintados area, 50 miles inland from Iquique. A second is to be drilled in the Salar de Pedernales area.

COLOMBIA—Building of Colombia's first gas line has started. By autumn of 1961, the 132-mile 10-in. line should be carrying 35 mmcf/d of natural gas from Cicuco field to Barranquilla. Partners in the venture are Texaco and Mobil, each holding a 25% interest.

ECUADOR—Among Europeans interested in the oil possibilities of the interior of Ecuador are Belgian, German, and French firms, according to Ecuador's minister of mines and hydrocarbons, Vicente Levi Castillo. The potential oil area, which extends southwest from Esmeraldas province to the Gulf of Guayaquil, recently was outlined by Dr. V. S. Paulik, Austrian geologist.

GUATEMALA—Delhi Guatemala Oil Co., S. A., has a permit from Guatemala to construct a refinery of 10,000 b/d capacity at the port of Matias de Galvez about three kilometers from the wharves. The site will be about 130 hectares in area. The permit, which runs for 40 years, has been signed by the Minister of Economy and the president of Guatemala.

GUATEMALA—As operator for itself, Continental, and Amerada, Ohio Oil Co. will soon spud its third Guatemalan wildcat at La Pita in the Lago Reposta area. For the three-company venture, Ohio already has drilled two unsuccessful 10,000-ft tests.

MEXICO—The newly completed 500-mile 24-in. 300-mmcf/d Pemex pipeline has started flowing gas from the Isthmus north to Mexico City industrial plants, and eventually for petrochemical installations at the government agency's refinery. Later the gas line will be extended northward still farther to the Pemex refinery at Salamanca.

MEXICO—Pemex, Mexician government oil agency, plans to complete more than two wells per day during 1961. Most of the drilling will take place in old field areas along Mexico's Gulf Coast where deeper pays (below 10,000 ft) are the source of most of the country's new production.

TRINIDAD—With Sun Oil and Pure Oil as partners, Pan American International will be operator for a 15-year exploration license on two million acres offshore the east and southeast Atlantic coasts of Trinidad. Initial period is five years, with two permissible five-year extensions. With minimum and maximum expenditures to be spelled out on a per-acre basis, first year's expenditures are estimated at $500,000. Reportedly, to conform with legislation now awaiting government approval, a 50-50 profits split will include 12½% royalty in the government's 50%.

Servino Medico (left), South American pipeline construction contractor, confers with John Manley, export sales manager for Crose-Perrault Equipment Corp., during Medico's recent visit to Tulsa. Medico's company, Hermanos Medico, C.A., Contratistas, will use the equipment on a 120-kilometer, 8-inch gas line from Casigua to La Fria (Venezuela) for Instituto Venezolano De Petroquimica, completion of which is scheduled within three months. The Medico firm headquarters in Puerto La Cruz, Venezuela.

VENEZUELA—Crude oil production last year came to 2,846,100 b/d, a gain of 2.71%, or 75,100 b/d over the 1959 level. Venezuelan Sun Oil Co. was up 37,000 b/d, last year over the year before; Mene Grande Oil Co. was up 30,700 b/d, Superior Oil Co. was up 24,900 b/d; Phillips Petroleum Co. was up 24,800 b/d, Richmond Exploration Co., was up 15,700 b/d, and Mobil Oil Co. was up 7,000 b/d. But Compania de Venezuela was down 63,700 b/d and Creole Petroleum Corp. was down 14,400 b/d.

VENEZUELA—According to official Venezuelan government estimate, oil-company profits during 1960 dropped 9% to $390 million from $427 million in 1959. Government-industry profit split in 1960 was expected to remain at 69-31, same as in 1959.

VENEZUELA—Venezuelan government sources indicate Venezuela's oil revenues during 1960 were down about 3% from 1959. Venezuela received 82.2¢ per bbl in taxes on oil produced during 1960, compared with 87.1¢ during 1959. Oil-company amortization deductions increased to 30.7¢ per bbl in 1960 from 28.8¢ in 1958.

VENEZUELA—Crole Petroleum Co. has released another 65,000 acres in Lake Maracaibo, in addition to the 46,000 acres turned back in the summer of 1960. The acreage is in the Cabimas area. The company has also relinquished parcels near the Mara field, and offshore in the lake narrows east of Mara.

VENEZUELA—The executive board of Venezuela's new national oil company has been selected. One of its members, Carlos Rojas Davila, has been named as the board's general director. Other members include Jose Gil Yepez, geologist and petroleum engineer, chief of the oil ministry's development department; Jose Luis Padron, a reservoir geologist in the oil ministry; and Angel Felix Bravo, director of the Venezuelan Oil Workers Federation.

NEW PUBLICATIONS

"Petro-Chem Guide to Europe," a 70-page, 8½ x 11 in. booklet, provides brief descriptions of the 400 leading chemical and petroleum firms in 18 countries of Western Europe. It gives information as to affiliations, subsidiaries, and participations in specific projects with other firms. A listing is included of European universities and institutes engaged in chemical research.

Published by Noyes Development Corp., 38 East 57th Street, New York 22, N. Y. Price, $12.00.

"Hazard of Water in Refinery Process Systems," and *"Hazard of Air in Refinery Process Systems,"* have each been brought out in new fourth editions by Standard Oil Co. (Indiana)'s manufacturing department, indicating the high degree of interest in these fine safety handbooks in the few years since they were initially prepared.

Each one has been prepared under the direction and inspiration of J. C. Ducommun, manufacturing vice president of the company, who has spearheaded a program for increasing management's awareness of the importance of safety in both his own company and in the American Petroleum Institute. Both booklets are well illustrated, down-to-earth approaches pointing out the very real hazards of air and water in refining processes, and presenting ways and means to correct or eliminate them.

The booklets are being made available at cost to the industry. Address queries to the American Oil Co., Department of Public Relations, 910 So. Michigan Ave., Chicago 80, Ill.

"Standard for Field Welding of Pipe Lines," API Std. 1104, March, 1961, 7th Edition. In use since 1953 when the first edition was published, this standard has received wide acceptance in the industry as a guide for pipe line welding procedures in the field. The new seventh edition contains two major changes which are related and were adopted so that one size die and plunger could be used for all guided bend tests, regardless of type or thickness of material being tested. A number of editorial corrections also have been included.

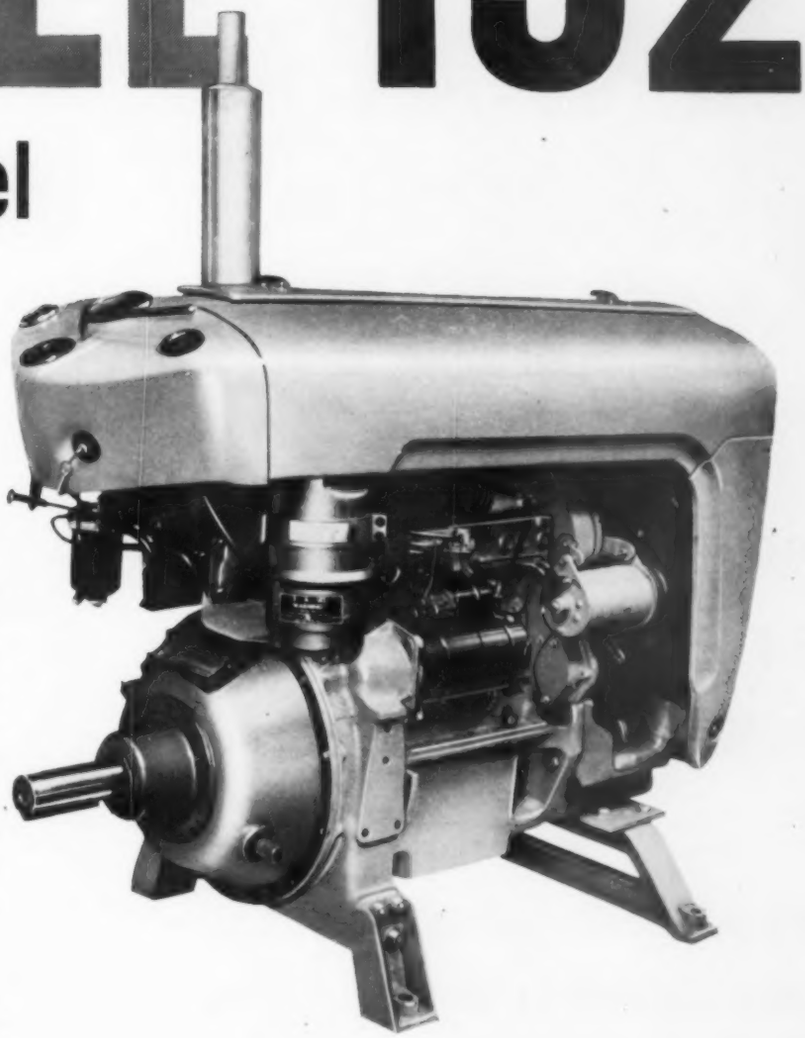
Copies may be purchased from the Publications Section, American Petroleum Institute, 1271 Avenue of the Americas, New York 20, N. Y., at 50¢ per copy.

Perkins OF PETERBOROUGH

announce a new power unit of outstanding versatility

the THREE 152

Industrial diesel



Designed for a variety of stationary applications

Here is a power unit of distinctive appearance . . . easy accessibility, thanks to a hinged tractory-type engine canopy . . . plus outstanding versatility. The 3 cylinder 36 b.h.p. engine produces its maximum torque of 110 lbs. ft. at 1250 r.p.m. and will find immediate applications in pumping sets, compressors, crushing plant and numerous forms of stationary industrial plant.

This new power unit is offered complete with no fewer than 11 varying rear end arrangements and all instruments are built into a specially designed control panel.

Perkins HIGH QUALITY DIESELS

. . . FOR INDUSTRIAL, CAR, VEHICLE, AGRICULTURAL AND MARINE APPLICATIONS

PERKINS ENGINES LIMITED · PETERBOROUGH · ENGLAND

GREP

GROUPEMENT DES SOCIETES ENTREPOSE

ET PARISIENNE POUR L'INDUSTRIE ELECTRIQUE

EN VUE DE L'ETUDE ET DE LA POSE DES PIPE-LINES

3 RUE DE LIÈGE — PARIS 9e — PIG-81-89

ALGER — 14 Bd Pt DOUMER

SFAX — IMMEUBLE MATTOUK RUE MONJI-BALI

ENGINEERING AND CONSTRUCTION

FOR PIPE-LINES — PUMPING STATION

GATHERING SYSTEMS AND ALL PIPE WORK

PIPE-LINE HASSI-MESSADUD-BOUGIE 24" (446 KMS)

PIPE-LINE IN AMENAS-LA SKHIRRA 24" (509 KMS)

PIPE-LINE HASSI R'MEL-ARZEW 24" (335 KMS)

PIPE-LINE OHANET-HASSI-MESSADUD 30" (325 KMS)

MIDGET WEIGHT INDICATORS

A New Concept In Weight Indication for the Well Servicing Unit

Where no deadline anchor is required, the MIDGET anchors the line with a heavy-duty, extremely rugged hydraulic cylinder and piston. The signal developed is transmitted to the gauge maintained near the hoist operator.

The gauge is a 6" fluid filled instrument of the highest quality with a damper for adjusting the pointer movement to the proper sensitivity. The fluid filled case also reduces severe pointer movement and lubricates and protects the working parts.

Two pointers are provided, one reads the total hook load in pounds for two or four lines strung, and the other is a target pointer.

A quick coupling located in the rear of the instrument box permits the cylinder and hose assembly units to be quickly separated without loss of fluid or altering the calibration.

MARTIN DECKER

WRITE FOR DESCRIPTIVE LITERATURE P-98
MARTIN-DECKER CORPORATION
3431 CHERRY AVENUE, LONG BEACH 7, CALIF.

World's principal manufacturer of Oil Well Drilling Instrumentation

Completely New!

6th Edition

BRANTLY ROTARY DRILLING HANDBOOK

For the sixth time in the past quarter of a century J. E. Brantly and his staff of expert engineering editors have completely rewritten the Brantly Rotary Drilling Handbook to cover new developments in the equipment and technology of drilling.

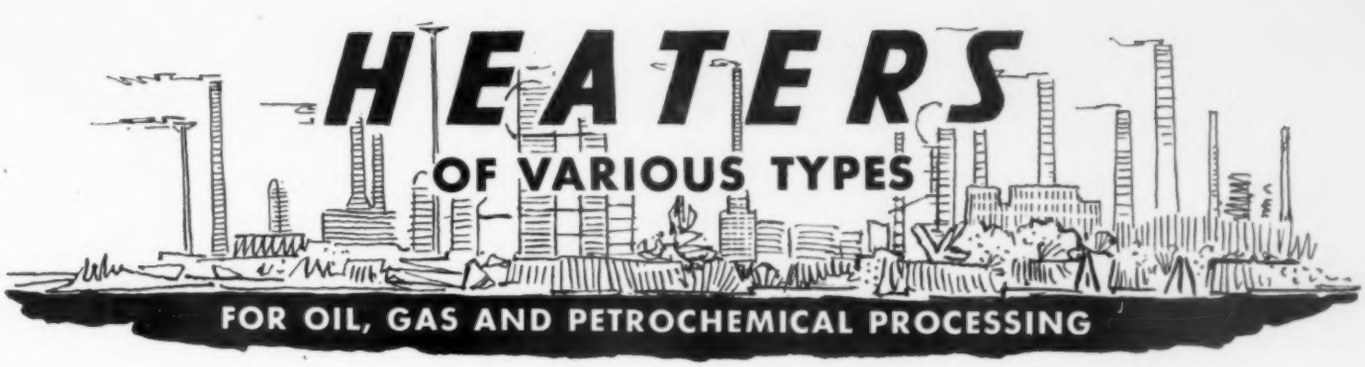
The new edition is more than 20 percent larger than its most recent predecessor. Illustrations including practical nomographic charts and performance curves have been increased from 122 to 603 in the new edition.

Bound in sturdy black fabricoid with rounded corners for long service at the rig as well as in the office, *the new sixth edition is now ready for shipment at $12.50 per copy, postpaid.*

Order from:

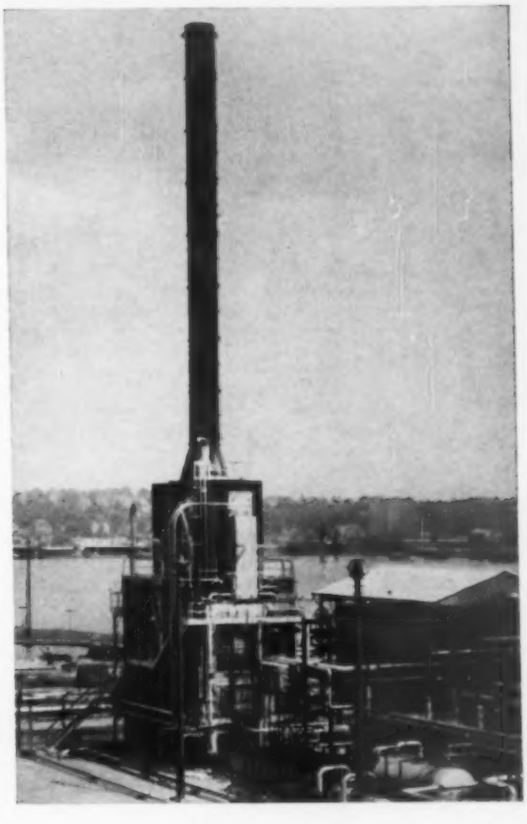
PALMER PUBLICATIONS

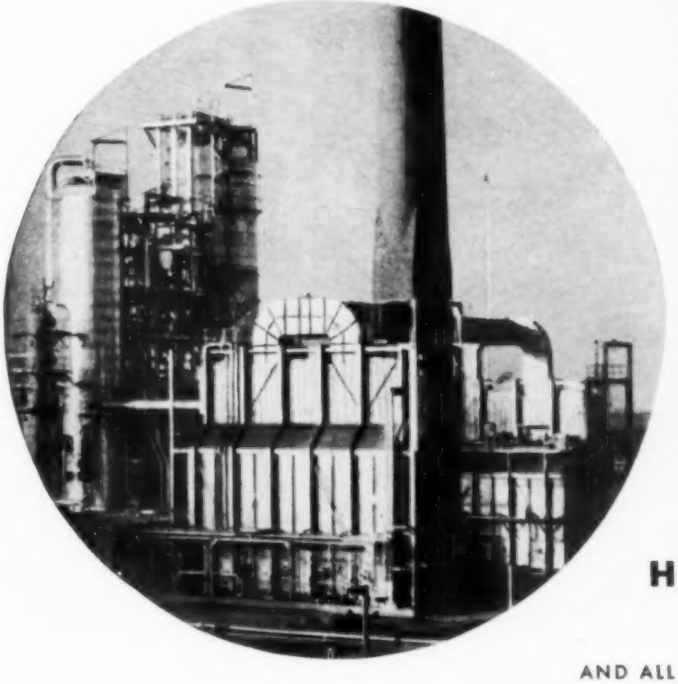
25 West 45th St., New York 36, N. Y.



HEATERS
OF VARIOUS TYPES
FOR OIL, GAS AND PETROCHEMICAL PROCESSING

will be especially designed for your heating requirements. Updraft-, box-, cylindrical-heaters with horizontal or vertical tubes and special airheaters are at your disposal.





Many years of experience and development guarantee maximum technical standard for complete design and delivery

HEAT ENCLOSURE METHODS
SYSTEM »DETRICK«

AND ALL LININGS WITH:

- **INSULATING FIREBRICK**
- **CASTABLE REFRACTORY**
- **CASTABLE AND BLOCK INSULATION**
- **GUNNITE APPLICATION**

CLAUDIUS PETERS A.G.

HAMBURG 1 · POST-BOX 790

New Logging Program

A new "Preferred Logging Program" has been issued by Lane-Wells Co. to aid logging users in the selection of the right service for the information desired. Listing all Lane-Wells open hole and cased hole logs, it shows at a glance the correct log or combination of logs for every use under various hold conditions. The major areas of oil activity in the USA are listed in geographical subdivisions for easy reference. This new brochure, No. PL-261, is available on request from Lane-Wells Co., P. O. Box 1407, Houston 1, Texas.

Bahama Firm Names Two

Aero Service (Bahamas) Ltd., a subsidiary of Aero Service Corp., Philadelphia, has appointed Charles Keck and William DesLaurier as vice presidents of the new company. Mr. Keck, who has been a technical representative of the worldwide air survey company in the Middle East since 1954, makes Beirut his headquarters. DesLaurier, who has represented the company in Europe and Africa for four years, is situated in Madrid.

API Awards to Two Men

Two southwestern US oilmen received special tribute from the American Petroleum Institute at the southern district meeting in Shreveport. The awards—in the form of the API Citation for Service—were to George R. Gray, Baroid division, National Lead Co., Houston; and Lloyd A. (Pete) Little, Lufkin Foundry and Machine Co., Lufkin, Texas. Gray's award is in recognition of outstanding service since 1951 to oil-well drilling fluids studies and the technology thereof. The award to Little recognizes his service in the API's oil-well production equipment standardization program.

Nonionic Surfactant

Dowell Division of Dow Chemical, P. O. Box 536, Tulsa, Okla., has published a data sheet on "Ezeflo" a water-soluble, non-ionic surfactant offered to increase injectivity of flood water in secondary recovery projects. Copies are available on request.

Crose-Perrault

Milan Co. inspects Crose equipment. (Left to right) John Manley, export sales manager for Crose-Perrault, Tulsa, discusses the advantages of his firm's equipment with Dott. Ing. Emilio Magnaghi, general superintendent for Techint—Compagnia Technica Internazaionale of Milan, Italy; Alberto Tranchini, who is associated with the Techint Co. in New York; and Phil Davidson, salesman for Leland Equipment Co., Tulsa. Magnaghi, accompanied by Tranchini, is making an inspection tour of the U.S. in conjunction with Techint's most recent work—that of laying 320 miles of 6-inch pipe in Syria for General Petroleum Authority. The pipe line will run from Homs to Damascus, Alep and Lataquia. Techint, with offices throughout the world, has done pipe line construction and engineering work in South America, Europe and the Middle East. The Milan firm uses Crose equipment.

"Vibroseis" Licensee Selected

Continental Oil Co. has selected Seismograph Service Corp., Tulsa, as a licensee for "VIBROSEIS" exploration service, Continental's entirely new system of seismic exploration.

Seismograph Service, a geophysical contracting firm, will offer this new system of seismic exploration in certain foreign areas. The new method was developed by Continental research and exploration personnel and has been successfully tested during the past several years in the company's own domestic exploration program.

The 'VIBROSEIS' system is regarded by many geophysicists as one of the most significant break-throughs in seismic exploration science in the past two decades, according to President L. F. McCollum of Continental. "In this system, vibrators on the surface of the earth are used to generate seismic waves, instead of utilizing buried explosive charges or dropping weights as is presently done," he said.

G. H. Westby, president of Seismograph Service Corp., said his firm's world-wide organization would integrate the new "VIBROSEIS" system into its exploratory work. It will be offered by Seismograph Service's overseas divisions as soon as possible.

The system eliminates the need for drilling shotholes and using explosives. In desert areas or where the surface formations are hard, savings can be realized in transportation, dynamite costs, drilling supplies and water. In locations where nearby buildings and water wells are a problem, the hazard of damage by explosives is eliminated, making it possible to explore in areas where conventional methods are not permitted.

National Tank Elects Francis

Alex W. Francis, Jr., vice president and director of National Tank Co., has been elected president, succeeding Jay P. Walker, founder and president of National since 1926. Walker will remain chairman of the board.

The announcement also stated Judson D. Lowd would succeed C. G. Wells as executive vice president. Wells was elected vice chairman of the board and chief executive officer.

Libya Oil Maps

Jack Ammann, Inc., has geological maps of Libya, immediately available to assist you in locating concession areas of the most promise in this vital region.

WE CAN FURNISH:
PHOTOGEOLOGIC MAPS
CONCESSION MAPS
TOPOGRAPHIC MAPS
AERIAL PHOTOGRAPHS
MOSAICS
PLANIMETRIC MAPS

Our maps and services are immediately available to you for the Libya area, the Rocky Mountain region of the U.S., Alaska, or anywhere in the world.

Write for New Complete Brochure of Our Services

30 Years of Service to the Oil Industry

JACK AMMANN, INC.
ENGINEERS and SURVEYORS
Broadway at Tenth, San Antonio 5, Texas, U.S.A.

For more details, you are invited to visit

COMPAGNIE GENERALE DE GEOPHYSIQUE

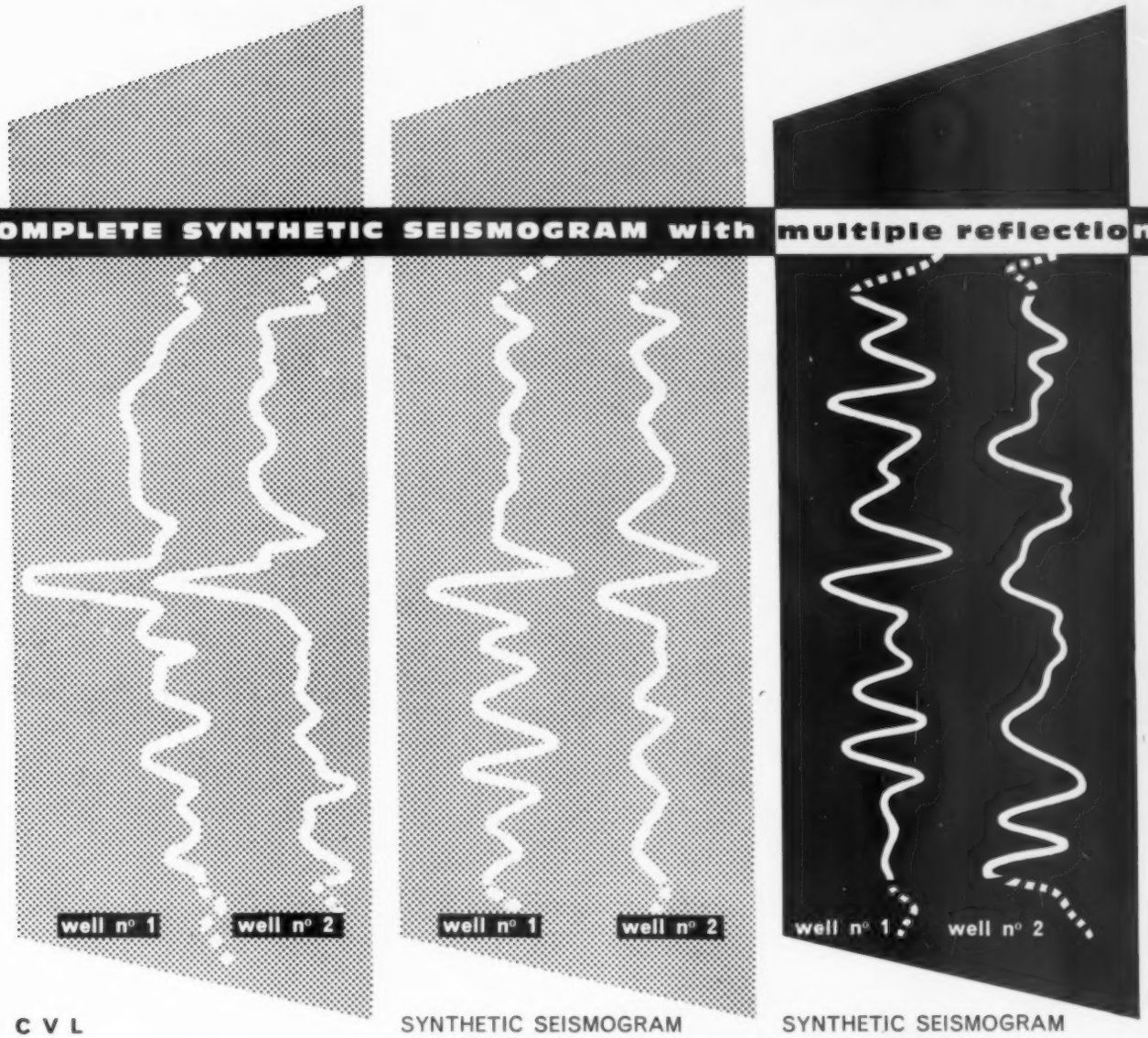
BOOTH 41

DENVER April 24 to 27

1961 Annual Meeting A.A.P.G.

A new method of improving the presentation and the interpretation of seismic records

THE COMPLETE SYNTHETIC SEISMOGRAM with multiple reflections



C V L

SYNTHETIC SEISMOGRAM WITHOUT MULTIPLES

SYNTHETIC SEISMOGRAM WITH MULTIPLES

What geological and geophysical information can be obtained after synthetic seismograms are examined and are compared with the actual records ?

The synthetic seismograms make it possible to ascertain the existence and the quality of the horizons which may be used as good markers

The synthetic seismogram leads to improvements of the field techniques : automatic gain control and filtering

The synthetic seismograms are conducive to a more complete and more acurate interpretation

Using the synthetic seismogram your past and present surveys can attain their full value

The cost of a synthetic seismogram with multiple reflections varies with the depth logged : 20 to 25 % of the cost of the logging operations proper

For a borehole of average depth, this cost is no higher than that of one kilometer of seismic profile

YOU TOO WILL BENEFIT FROM THE USE OF THIS NEW GEOPHYSICAL TOOL

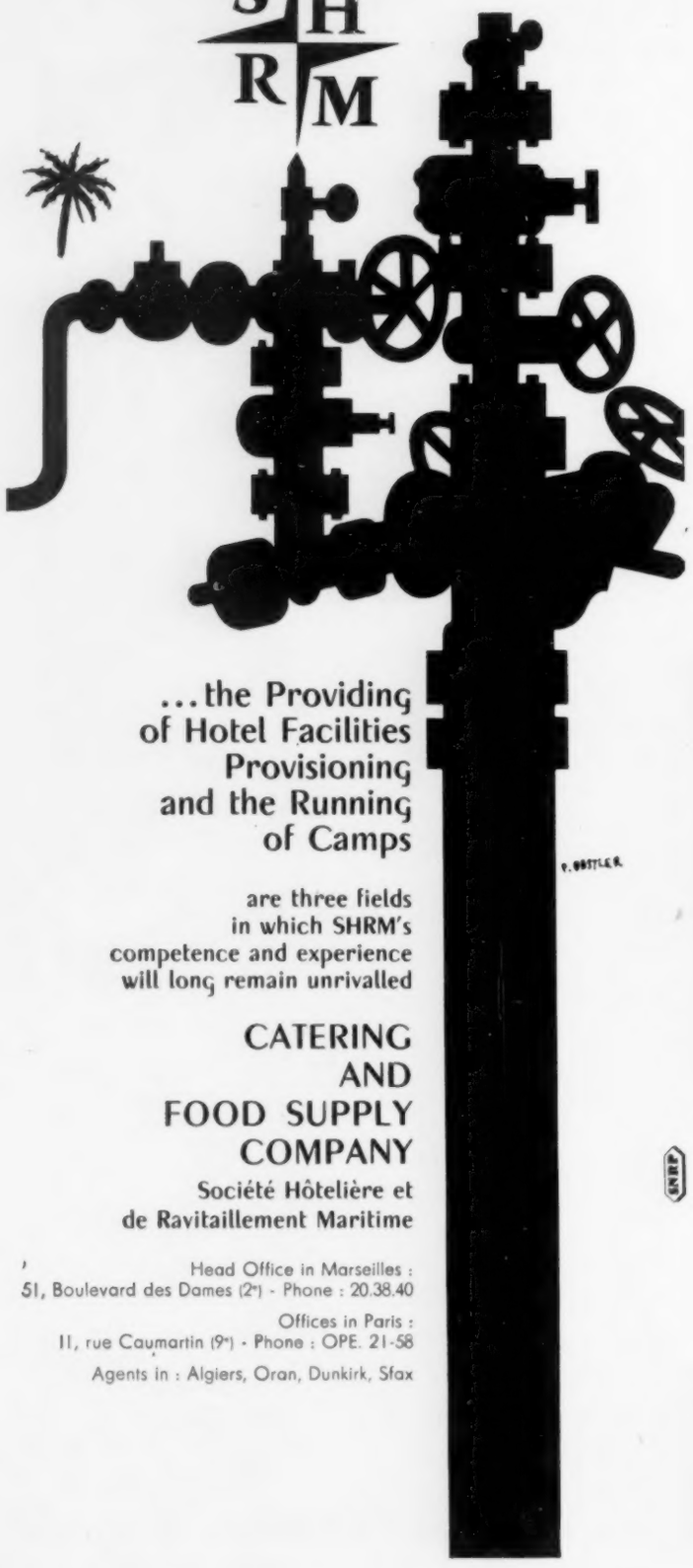
GG

COMPAGNIE GÉNÉRALE DE GÉOPHYSIQUE

50, rue Fabert - Paris 7e - Phone : Invalides 46-24

IN THE SAHARA
as elsewhere...

S H
R M



...the Providing
of Hotel Facilities
Provisioning
and the Running
of Camps

are three fields
in which SHRM's
competence and experience
will long remain unrivalled

CATERING
AND
FOOD SUPPLY
COMPANY

Société Hôtelière et
de Ravitaillement Maritime

Head Office in Marseilles :
51, Boulevard des Dames (2e) - Phone : 20.38.40

Offices in Paris :
11, rue Caumartin (9e) - Phone : OPE. 21-58

Agents in : Algiers, Oran, Dunkirk, Sfax

IDECO-WOODFIELD
Streamlined ROTARY TABLES

. . . available from England

. . . with the following features

★ *Built-in safety features; non-slip surface; no projections.*

★ *Fabriform steel case for maximum strength, minimum weight.*

★ *Positive one-point lubrication; all moving parts—oil-bathed.*

★ *Precision-built; effective top and bottom neoprene mud-seals.*

★ *Practical design; separate replacable pinion shaft capsule.*

IDECO WOODFIELD

WOODFIELD ROCHESTER LTD.
FRINDSBURY WORKS · ROCHESTER · ENGLAND
TELEPHONE: STROOD 78421
Woodfield manufacture Ideco Oilfield Equipment

LET GEOLOGRAPH HELP YOU FIND THE PAY SAND

The Geolograph Recorder is of great assistance in locating Pay Sands, determining Effective Pay Thickness, and showing sections of greater Porosity.
From India to Texas the Geolograph Recorder is furnishing the finest Mechanical Well Logging records available. Wherever oil is found, Geolograph is helping to find it.
Let GEOLOGRAPH Help You.

For Sale Outside the United States and Canada

THE
GEOLOGRAPH
COMPANY ®
MANUFACTURERS ● EXPORTERS
27 N.E. 27TH • P.O. BOX 1291 • OKLAHOMA CITY 1, OKLA.

British Oxygen service, backed by over 75 years' experience, plays a major role in the industrial development of North Africa. In the new and expanding oil industry, Saffire oxy-acetylene equipment covers the field of gas cutting, welding, heating and flame cleaning. There is a wide range of machines both for pipe cutting and for automatic arc welding.

In the electric arc welding field there are Celtian electrodes for Stove-pipe welding of storage tanks, as well as automatic installations for Double-ending and girth seam welding. And to power these operations there are Quasi-Arc transportable diesel-driven generator sets. British Oxygen provide equipment and experience in many forms for the world of petroleum.

BOC British Oxygen equipment and experience in North africa

THE BRITISH OXYGEN COMPANY LIMITED, EXPORT DEPARTMENT, 1/11 HAY HILL, LONDON, W.1 ENGLAND CABLES—BRITOXYGEN, LONDON

ADVERTISERS' INDEX

(Advertising Agencies in Italics)

Accialerie e Ferrerie Lombarde Falck — 57
Energia Establishment

Jack Ammann, Inc. — 94
Pitluk Advertising Company

Bechtel Corporation — Cover III
Erwin Wasey, Ruthrauff & Ryan, Inc.

British Ermeto Corporation Ltd. — 4
A. T. A. Advertising Ltd.

British Oxygen Company Ltd. — 97
F. C. Pritchard Wood & Partners Ltd.

The British Petroleum Company Ltd. — 33
S. H. Benson Ltd.

Byron Jackson Tools, Inc. (A Subsidiary of Borg-Warner Corporation) — 14
John Ramsey Company

California Texas Oil Company Ltd. — 21
Gaynor & Ducas, Inc.

Camdrill International, Inc. — 84

Cameron Iron Works, Inc. — Cover II
Boone & Cummings

Cape Insulation & Asbestos Products Ltd. — 26-27
Taylor Advertising, Ltd.

Carlyle Air Conditioning & Refrigeration Co. Ltd. — 79
G. Street & Company Ltd.

Chicago Bridge & Iron Company — 11
Ladd, Southward & Bentley, Inc.

Chiksan Company — 31
The McCarty Company

Chrysler International Ltd. — 22
Publicontrol S. A.

Clark Brothers Company, One of the Dresser Industries — 7
Persons Advertising, Inc.

Costain & Press (Overseas) Ltd. — 63
Dorland Advertising Ltd.

Crane International — 54
National Export Advertising Service, Inc.

Crose-Perrault Equipment Corporation — 98
Paul Locke Advertising, Inc.

Daimler-Benz AG. — 35
Heumann Werbegesellschaft

C. Deilmann Bergbau Gmbh. — 69
Gesellschaft fur Industrie Beratung mbh.

English Electric Company Ltd. — 77
The Technical Advertising Service Ltd.

Ethyl Corporation — 1
Reach, McClinton & Company, Inc.

Ferodo Limited — 71
Armstrong Warden Ltd.

Fibreglass Limited — 82
Notley Advertising Ltd.

Fifth Avenue Hotel — 88
Daniel & Charles, Inc.

Forafrance Company — 6

General American Transportation Corporation — 9
Edward H. Weiss & Company

The Geolograph Company — 96
Lowe Runkle Company

Compagnie Generale De Geophysique — 94-95
OEDIP

GREP "Groupement des Societes Entrepose" — 92

Grove Valve & Regulator Company — 75
L. C. Cole Company, Inc.

Matthew Hall & Company, Ltd. — 89

Halliburton Company — 36
Glenn Advertising, Inc.

Frederic R. Harris Inc. — 78

Hughes Tool Company — 17-18
Foote, Cone & Belding

The M. W. Kellogg Company — 20
Fuller & Smith & Ross, Inc.

Ketjen N. V. — 61
Raedt en Baet

Lafarge Aluminous Cement Company Ltd. — 87
Allardyce Palmer Ltd.

Lincoln Electric Company Ltd. — 70
London Press Exchange

The Lummus Company — 2, 5
G. M. Basford Company

Mannesmann-Export, Gmbh. — 15
Hassenpflug & Lindstrom Gmbh.

Manning, Maxwell & Moore, Inc. — 73
Fuller & Smith & Ross, Inc.

McCullough Tool Company — 25
Raymond O. Perry, Advertising

Martin Decker Corporation — 92
Dozier Eastman & Company

Mission Manufacturing Company — 81
Rives, Dyke & Company

Motherwell Bridge Contracting & Trading Company Ltd. — 72

Newman Hender & Company, Ltd. — 67
Adams Brothers & Shardlow Ltd.

The Offshore Company — 13
Fetty & Hundemer Inc.

Oil Center Tool Company — Cover IV
Rives, Dyke & Company

F. Perkins Ltd. — 91
Crane Publicity Ltd.

Claudius Peters AG. — 93

The Pick-Congress Hotel — 34

Procon, Inc. — 24
Tobias, O'Neil & Gallay, Inc.

Robert H. Ray Geophysical Company — 86
Rives, Dyke & Company

Santa Fe Drilling Company — 76
Dozier Eastman & Company

Scammell Lorries Ltd. — 85
Mayfair Advertising Ltd.

Schlumberger Overseas — 53
Rives, Dyke & Company

S.H.R.M. Catering & Food Supply Company — 96

Peter Spence & Sons Ltd. — 65
Holmwood Advertising Ltd.

Standard Oil Company of New Jersey — 8
McCann-Erickson, Inc.

Transport Equipment (Thornycroft) Ltd. — 83
Gould & Portmans Ltd.

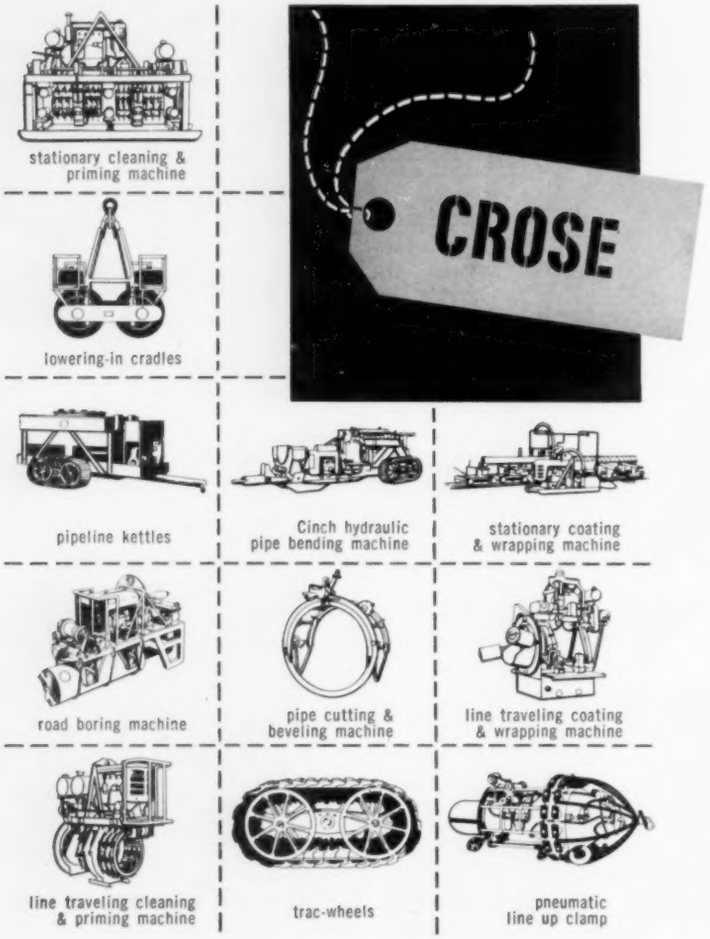
Universal Oil Products Company — 28-29
Tobias, O'Neil & Gallay, Inc.

Universal Oil Products Company, Products Dept. — 23
Tobias, O'Neil & Gallay, Inc.

Werkspoor N. V. — 30
Mark Fawdry Ltd.

Wilson Supply Company — 19
Craig & Associates, Advertising

Woodfield Rochester Ltd. — 96
KS Advertising Ltd.



THIS NAME ASSURES QUALITY PIPELINE EQUIPMENT

At Crose the word "quality" means two basic things. First, that the equipment has been engineered and designed to perform under the toughest conditions. Secondly, that the equipment will deliver long-term performance with maximum efficiency and lowest maintenance costs. That's the kind of quality you get in Crose equipment — and it's available through many strategic supply points.

Crose perrault
EQUIPMENT CORP.

2765 DAWSON RD., TULSA, OKLA., Phone WEbster 6-2171
BRANCH OFFICES: Houston, Texas, Ph. Mission 5-2484 • Elizabeth, N. J., Ph. ELizabeth 4-4244 • EXPORT OFFICE: Suite 824, 295 Madison Ave., New York, N. Y., Ph. MUrrayhill 9-3484 • IN CANADA: CROSE-PERRAULT CANADA, LTD., Edmonton, Alberta • Toronto, Ontario

Bechtel Completes

NORWAY'S FIRST MAJOR REFINERY

Another grass roots refinery—this one in Norway—has been added to the string completed by Bechtel. Designed to meet the rapidly increasing demand for Esso petroleum products in Scandinavian countries, it is located at Slagen, near Tonsberg, Norway. The project was built on schedule and under the budget.

The new 42,200 barrels-per-day refinery—a hydroskimming type designed by Esso Research and Engineering Company—is owned by A/S Esso-Raffineriet, Norge, a subsidiary of Standard Oil Company of New Jersey.

Bechtel supervised engineering and procurement. Construction was performed by Bechtel in a joint venture through the medium of A/S Bechtel-Sverdrup Norge.

BECHTEL

BECHTEL CORPORATION

Engineers and Builders for Industry

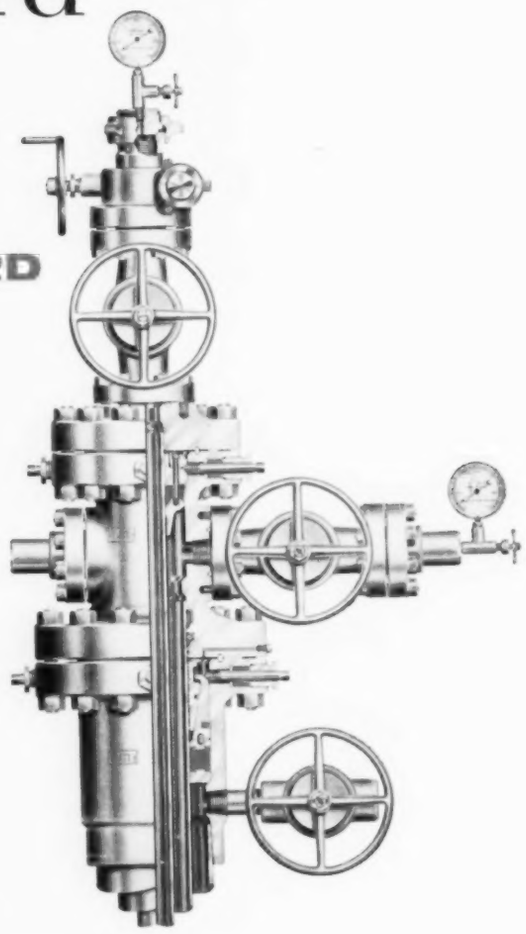
SAN FRANCISCO • Los Angeles • New York • Houston

Bechtel International Limited • London

Bechtel International Company • Paris

European Bechtel Corporation • A/S Bechtel-Sverdrup Norge

The O·C·T Standard Tree



STILL THE "STANDARD OF THE OILFIELD"

The O-C-T Standard Tree is a combination of an O-C-T casing head, O-C-T tubing head, master valve of your choice, and an O-C-T flow control.

Thousands of O-C-T Standard Trees are performing in oilfields around the world. The strength, simplicity, and flexibility of the Standard Tree made it the "standard of the oilfield" years ago.

Constant improvements to the O-C-T Standard Tree have made a good tree better. Today, more than ever, informed buyers can say, "There is no better hookup."

where progress is a daily practice

O·C·T

OIL CENTER TOOL CO.

SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

Address Export Inquiries for All Countries to
P. O. Box 3091, Houston, Texas.